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STEVENS CREEK BASIN TRUNK SEWER
TECHNICAL MEMORANDUM NO. 3 - HYDRAULICS
AND PRELIMINARY MODELING FOR
ALIGNMENT ANALYSIS

FINAL

June 2004



CITY OF LINCOLN, NEBRASKA
 STEVENS CREEK BASIN TRUNK SEWER
 TECHNICAL MEMORANDUM
 NO. 3

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Technical Memorandum No. 3

HYDRAULICS & PRELIMINARY MODELING

1.0 INTRODUCTION

The purpose of preliminary modeling is to establish the peak design flow from the various subbasins and to determine the preliminary size of the Stevens Creek Basin Trunk Sewer that will be required to convey these flows to the Northeast Wastewater Treatment Plant (NE WWTP). Several scenarios were modeled to provide the City with the information needed to select a trunk sewer to provide capacity for the west side or a combination of the west and east side (future) service areas. In addition, preliminary slopes, depth of flow, velocities, and locations of structures were identified.

It should be noted that the preliminary modeling is not to be used as the method for the selection of the preferred alignment. The selection of the preferred alignment will be completed after the basic decisions relating to the area to be served have been identified. Once the preferred alignment has been selected, additional field reconnaissance will be conducted. This reconnaissance will include field survey to verify stream flow lines, locating major utilities and collecting other data. At this point, the model will be refined to reflect the preferred alignment and the actual field survey. Additionally, it is recommended that the model be revisited during final design to reflect any changes made.

2.0 HYDRAULIC BASICS

2.1 Manning's Equation

The Manning's Equation is the most commonly used resistance formula for the analysis of open channel and gravity flow pipe systems. The equation modified to English Units is shown below.

$$V = \frac{1.49}{n} R^{\frac{2}{3}} S^{\frac{1}{2}}$$

Where:

V = Average velocity (ft/sec)

R = Hydraulic radius (ft)

S = Slope of the Energy Grade Line (ft/ft)

'n' = Roughness coefficient

The roughness coefficient varies depending on the type of material. For example, glass would have an 'n' value of 0.010 while earth channels would have an 'n' value of 0.020. There has

been much debate about the appropriate ‘n’ value used for different piping materials in sanitary sewer systems. To complicate the debate, the slime layer that thrives on the wetted portions of the sanitary piping also contributes to and affects the actual value of ‘n’.

Due to the unknowns at this time, such as the actual type of the pipe installed, the number of joints in the piping system, and the affect that the slime layer will have on the ‘n’ value, a conservative value of 0.013 has been adopted for this project, which is the most commonly used ‘n’ value for the evaluation and design of sanitary sewer systems.

2.2 Depth of Flow (d/D)

The design flow rate in pipes 36 inches in diameter and smaller was limited by a depth ratio (d/D) of 0.75. Likewise, for pipes larger than 36-inches in diameter the d/D was limited between 0.85 and 0.90.

The gravity flow of wastewater in pipelines is an inherently transient process. Transient waves are created at flow input locations and where the pipelines change direction. These transient waves have been observed to effect the downstream as well as the upstream flow regime. The magnitude of the transient waves depends on many parameters including the distance from the initial wave source, invert, slope, and pipe size. Therefore, even pipelines with a relatively constant slope and pipe size may experience varying velocities, d/D, and q/Q values in the same reach of sewer both upstream and downstream from the initial source of the transient wave. To evaluate the phenomena, the EXTRAN fully dynamic wave model has been utilized to simulate the transient waves in the Stevens Creek Basin Trunk Sewer, and to solve the associated time-dependent flow equations.

The model run outputs presented in the Appendix sections of this memorandum reflect this varying velocity, d/D, and q/Q related to the transient wave movement in the system. These varying parameters are the primary reasons for the minor differences in the flow for pipe reaches where no additional flow input is being introduced.

2.3 Pipeline Velocity

For this project the minimum design velocity in the trunk sewer is set at 3 ft/sec during full flow conditions. Likewise, the maximum design velocity in the trunk sewer system shall not exceed 10 ft/sec during full flow conditions.

2.4 Pipe Size

For the preliminary modeling effort, the trunk sewer and subbasin sewers were determined for pipe diameters down to and including 18 inches in diameter. The exception to this criteria is at junction structures where flows from small subbasins enter the trunk sewer. Pipe sizes from these small subbasins were determined for sizes less than 18 inches in diameter.

3.0 MODELING

3.1 Methodology

In order to accurately design and model the Stevens Creek Basin Trunk Sewer system it is necessary that the computer model be able to account for the time wastewater takes to flow from one manhole or structure to the next. For this to be accomplished, the model calculated the flow velocity based on the contributed flows at each input point to determine the time for this flow to reach the next input flow point. Inflows are added at each input point and the total flow is then used to calculate the travel time to the next downstream manhole or structure. The model then determines the water surface elevation at each manhole or junction structure so that the depth of flow and velocity can be determined.

XP SWMM and SewerCAD computer models were both used for the hydraulic analysis and modeling efforts. XP SWMM, marketed by XP-software, is a dynamic-state analysis tool and is an extremely powerful program for the design and analysis of flows in pipe networks. SewerCAD, marketed by Haestad Methods, is a steady-state analysis tool and one of the most advanced design, analysis, and planning tools, handling both pressurized force mains and gravity hydraulics.

3.2 System Layout

3.2.1 Utility Planning Zones

The City of Lincoln has developed utility planning zones. These zones are further separated into Tiers relating to the planning time frame when the need for sewage interceptors are anticipated to be needed as described in the *Wastewater Facilities Plan, Update*, October 2002. Tier I areas are defined as needing sewage interceptor service within the next 25 years, Tier II areas are defined as needing sewage interceptor service between 25 and 50 years, and Tier III areas are identified as needing sewage service 50 years or more into the future. These Tier zones generally follow the subbasin areas that were used to calculate the wastewater flows for the different modeling runs that are discussed in Section 1.5. A summary of these Tiers and the associated subbasins associated with them is as follows:

- Tier I includes subbasins E-1, E-2, E-3, E-11 and E-12.
- Tier II includes subbasins E-4, E-5, and E-6.
- Tier III includes subbasins E-7, E-8, E-9, and E-10.

3.2.2 Phasing

For the purpose of the preliminary trunk sewer modeling (Technical Memorandum No. 3) and subsequent alternative alignment analysis (Technical Memorandum No. 4), the west side of the Stevens Creek Basin Trunk Sewer has been divided into the following preliminary construction phases. The actual phasing of the construction may vary from that shown here as determined by the City as the project proceeds.

Tier I Areas (West Side of Stevens Creek):

- Phase I - NE WWTP (Junction Structure E-12) to Fletcher Avenue (Junction Structure E-11/E-6).
- Phase II - Fletcher Avenue (Junction Structure E-11/E-6) to Murdock Trail (Junction Structure E-1) which is located approximately half way between Havelock Avenue and Adams Street.
- Phase III - Murdock Trail (Junction Structure E-1) to Holdrege Avenue (Junction Structure E-2).
- Phase IV - Holdrege Avenue (Junction Structure E-2) to near 98th and "O" Street. (Subbasin trunk sewer that will serve Subbasin E-2).
- Phase V - Holdrege Avenue (Junction Structure E-2) to just north of "A" Street (Junction Structure E-3A).
- Phase VI - "A" Street (Junction Structure E-3A) to Van Dorn Street (Junction Structure E-4)

Tier II Areas (West Side of Stevens Creek):

- Phase VII - Van Dorn Street (Junction Structure E-4) to Pioneers Blvd (Junction Structure E-5G).
- Phase VIII - Pioneers Blvd. (Junction Structure E-5G) to Pine Lake Road (Junction Structure E-5C).
- Phase IX - Pine Lake Road (Junction Structure E-5C) to Yankee Hill Road (Junction Structure E-5A).

Tier II Area (East Side of Stevens Creek)

- Subbasin E-6 is the farthest north subbasin located on the east side of the Stevens Creek which is also identified as being a Tier II Zone.

A more detailed description of these phases is discussed in Technical Memorandum No. 4.

3.3 Hydraulic Model Development

SewerCAD was used to determine the physical constraints and characteristics, such as pipe size and structure locations. This was accomplished using minimum and maximum constraints such as depth of cover, velocity, and pipe slope. The output from SewerCAD was then used to define the model input for XP-SWMM. XP-SWMM was utilized to determine the dynamic hydraulic model of the trunk sewer system.

The basic information used to preliminarily size the sewers using the SewerCAD Program included:

- Ground surface elevation.
- Minimum and maximum cover over the pipe.
- Minimum and maximum allowed pipeline velocities.
- Mannings 'n'.
- Flow input data for each sub basin.
- Physical sewer manholes (nodes) location (located using Cartesian Coordinates).

The minimum and maximum cover, minimum and maximum velocities, and Manning's n were defined as modeling constraints as shown in Table 1 below. In general, the design constraints attempt to minimize excavation and pipe size while maximizing capacity.

| Table 1 Modeling Input Constraints Stevens Creek Trunk Basin Sewer City of Lincoln, Nebraska | |
|---|--------------|
| Constraint | Value |
| Mannings 'n' | 0.013 |
| Minimum allowable velocity at design conditions | 3 ft/sec |
| Maximum allowable velocity at design condition | 10 ft/sec |
| Maximum slope | Varies |
| Minimum slope | Varies |
| Maximum cover | 25 ft |
| Minimum cover | 15 ft |

3.4 Subbasin Inflow

The City's flow equation for peak design flow was used for the modeling of the Stevens Creek Basin Trunk Sewer as defined in Technical Memorandum 1 and as shown below.

$$Q = 0.01726 A^{(0.8)} + 0.003 A$$

Where:

Q = wastewater flow in cfs

A = Area in acres.

The only variable required to determine peak subbasin flow to the main trunk sewer is the contributing subbasin area. Subbasin areas were calculated from the City's two-foot contour intervals data using an automated ArcView GIS computer model. Prior to the actual modeling these subbasin areas were compared against the City Planning Department values. This comparison revealed that the GIS computer generated areas were within one percent of the planning departments values as shown in Table 2 below.

| Table 2 Comparison of GIS Data to City Data Stevens Creek Basin Trunk Sewer City of Lincoln, Nebraska | | | |
|--|---------------------------------------|--|---------------------------|
| Areas | Carollo Generated GIS Data | City Planning Department Data | Percent Difference |
| Total Basin | 35,189 acres | 34,860 acres | 0.93% |
| East Side | 17,879 acres | 17,735 acres | 0.81% |
| West Side | 17,310 acres | 17,125 acres | 1.07% |

In addition four subbasin were selected randomly and the areas were calculated using an electronic planimeter and "hand" calculations. These values were then compared to the GIS

generated areas to confirm the subbasin areas used in the modeling. This exercise revealed that the GIS generated areas were within acceptable limits as shown in Table 3 below.

| Table 3 Randomly Selected Subbasin Area Comparison Stevens Creek Basin Trunk Sewer City of Lincoln, Nebraska | | | |
|---|---------------------------------------|--|----------------------|
| Subbasin | GIS-generated Area (acres) | Manually-generated Area (acres) | Deviation (%) |
| E1 | 1485.024 | 1539 | 3.5 |
| E2 | 1816.941 | 1815 | -0.11 |
| E3 | 4405.285 | 4397 | -0.19 |
| E5 | 4818.472 | 4938 | 2.4 |

Prior to the modeling, three separate areas of the basin have been modified from the Planning Department's data as described below and shown in Figure 1.

- Area 1 - 228 acres of City owned land that is located primarily north of the NE WWTP has been removed from the model as it will be served from the north by another sewer collection system.
- Area 2 - 318 acres of land has been removed from subbasin E-5 as it is currently being served by another sewer system.
- Area 3 - 1049 acres of land has been removed from subbasin E-10 (on the east side of the creek) and has been added to Subbasin E-5 located on the west side of the creek. This change has been made since the creek is very shallow and the area appears to be very easily served by the west side trunk sewer.

With the above mentioned modifications to the total basin area included in the model is 34,641 acres, of which 17,811 acres is included in the west side of the creek and 16,830 acres is included in the east side of the creek. The floodplain areas in subbasin E-1, E-11, E-12 and E-6 were not included in the modeling. Table 4 below outlines the subbasin areas that were used for the modeling exercise.

Each subbasin has one or more wastewater flow input points where flow is introduced into the west side trunk sewer model. The major subbasin areas were used along with the City's peak flow equation to determine the flow from each subbasin. The inflow to the trunk sewer was determined using the total tributary area to the trunk sewer at each junction structure location. The formula is utilized in such a manner that as additional subbasin flows enter the trunk sewer, the area of the subbasins contributing to the flows are combined. The City's peak flow equation has a built-in dampening factor that decreases the total flow in the trunk sewer with an increase in cumulative subbasin areas. This dampening factor mimics the actual decrease in flow observed in a previous study of the Lincoln Salt Valley Basin. Therefore, once the subbasin areas are combined the flows are recalculated and the appropriate pipe size selected.

**Table 4 Subbasin Area
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska**

| Subbasin Name | No. of Sub-Subbasins | Area (acres) | | |
|----------------------|-----------------------------|---------------------|----------------|------------------|
| | | Minimum | Maximum | Total |
| E-1 | 6 | 16.358 | 662.512 | 1485.024 |
| E-2 | 13 | 23.457 | 455.142 | 1816.941 |
| E-3 | 19 | 24.636 | 583.784 | 4405.285 |
| E-4 | 12 | 30.523 | 896.149 | 3487.286 |
| E-5 | 36 | 3.494 | 504.068 | 4500.472 |
| E-6 | 12 | 14.749 | 948.115 | 4039.902 |
| E-7 | 8 | 7.191 | 508.368 | 1603.368 |
| E-8 | 22 | 0.057 | 652.677 | 4936.422 |
| E-9 | 21 | 0.126 | 586.749 | 3497.710 |
| E-10 | 17 | 0.025 | 933.066 | 2752.801 |
| E-11 | 9 | 31.209 | 413.455 | 1790.840 |
| E-12 | 2 | 89.730 | 235.593 | 325.323 |
| Total: | 177 | | | 34641.374 |

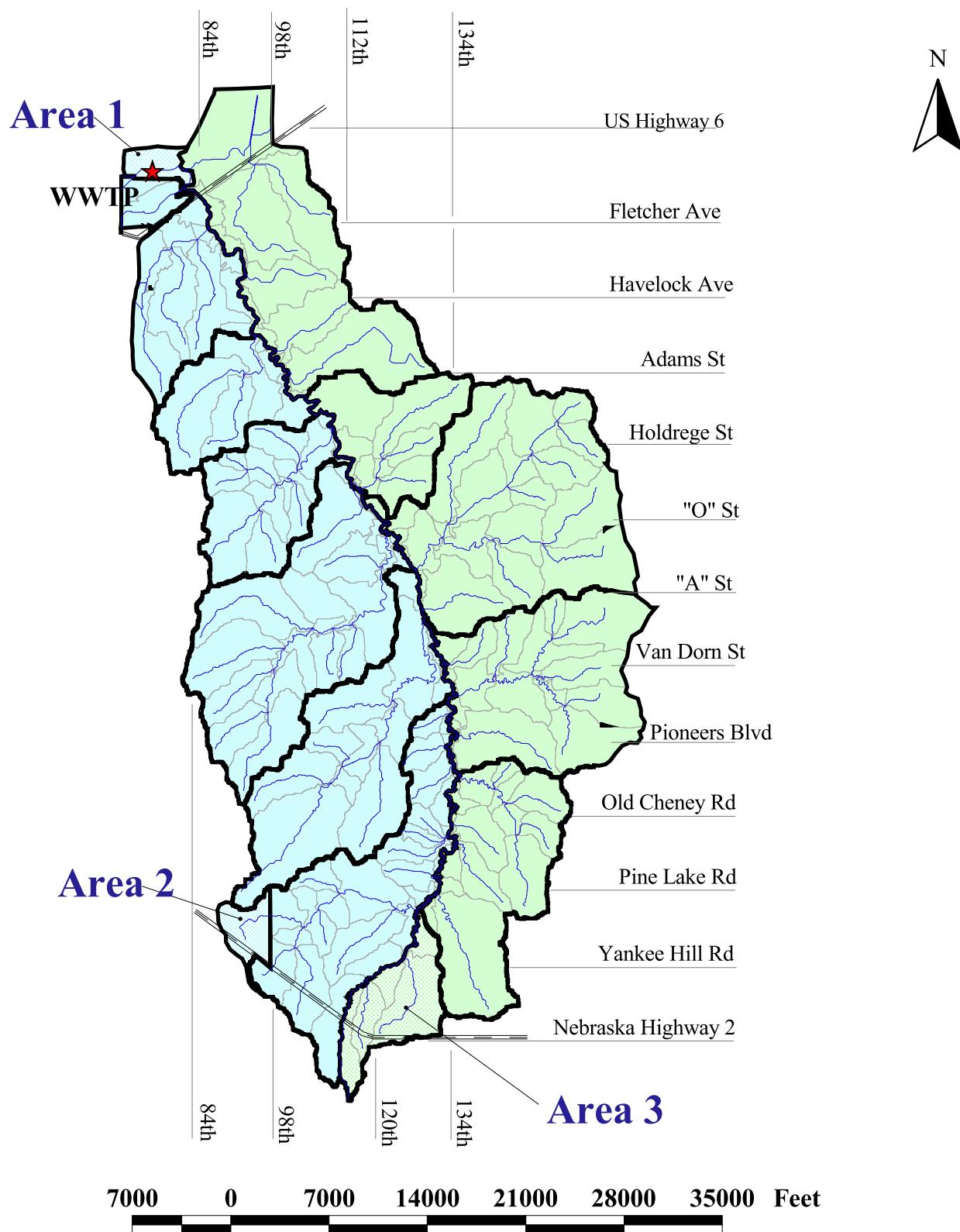


Figure 1
WATERSHED SUBBASINS AND
STREAM NETWORK
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

4.0 DESCRIPTION OF TRUNK SEWER MODEL RUNS

4.1 Trunk Sewer Model Run No. 1

This modeling run evaluates the flows from subbasins on the west side of Stevens Creek and includes the Tier I and Tier II zones, as shown in Figures 2 and 3. This trunk sewer alignment generally follows the west side of the creek except for one area near Adams Street where the trunk sewer crosses to the east side of the creek near Subbasin E-1 to avoid a hill which would result in excessive trenching, tunneling, potential conflicts with the stream and other construction related problems. A preliminary piping profile of this model run has been prepared as shown in Figure 4. A more detailed piping profile will be developed after the alignment (Technical Memorandum 4) has been selected. The trunk sewer alignment developed in this model serves as the base alignment for the subsequent model runs.

Table 5 lists each junction structure, as well as the pipe size of the trunk sewer, inflow and subbasin area associated with each junction structure. Pipe sizes for this model run range from 18 inches at the upstream end to 72 inches at the NE WWTP. To confirm the 72-inch Phase I segment of this model, a 66-inch pipe was also evaluated. The model revealed that a 66-inch pipe in this reach of the sewer was excessively surcharged. The detailed results of this model run are located in Appendix A.

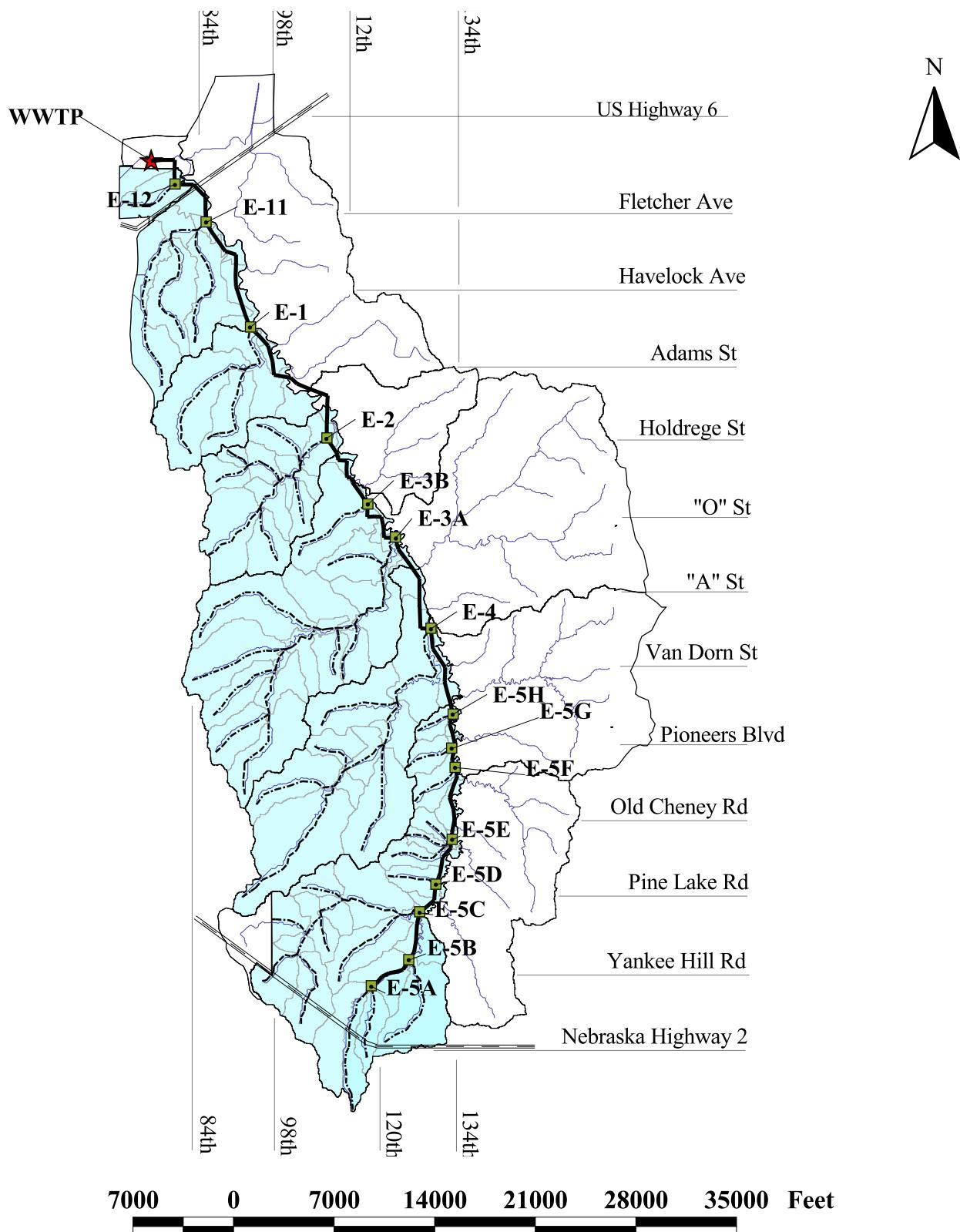


Figure 2
MODEL RUN NO. 1 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

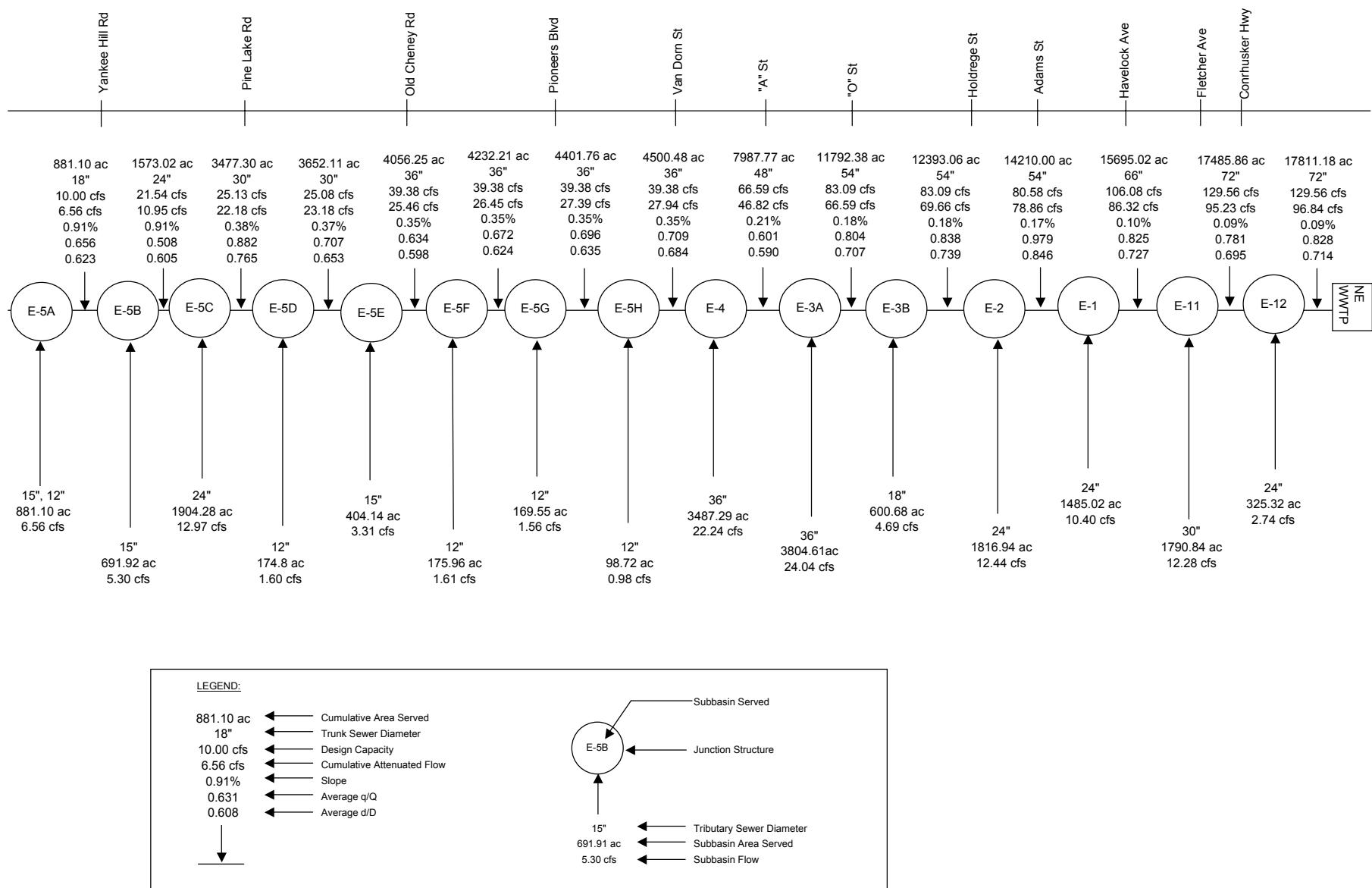


Figure 3
MODEL RUN NO. 1 FLOW SCHEMATIC
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

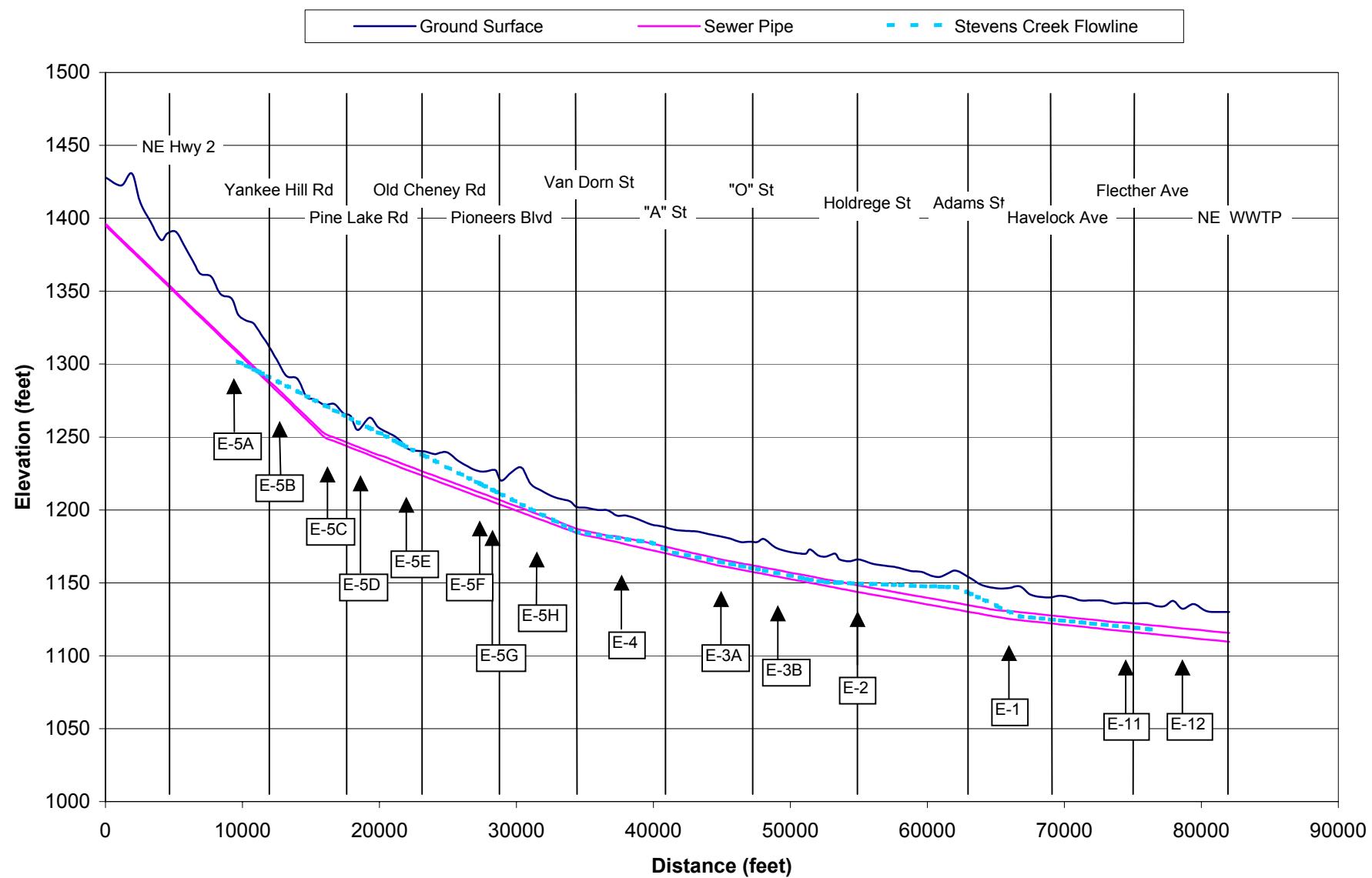


Figure 4
MODEL RUN NO. 1 PROFILE
 STEVENS CREEK BASIN TRUNK SEWER
 CITY OF LINCOLN, NEBRASKA

Table 5
Model Run No. 1 – Westside Only
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska

| Jct Box/ Manhole | Node # | Individual Sub Basins | | | Trunk Sewer | | | | | | Pipe Dia. Out (in.) |
|---------------------|-----------|------------------------------|----------------------|------------------------------------|---------------------------------|-----------------------------------|---|----------------------|--|-----------------------|------------------------------|
| | | Sub Basin Area (acres) | Sub Basin Q (cfs) | Attenuated Sub Basin Q (cfs) | Sub Basin Pipe Dia. (in.) | Cum. Area Served (acres) | Cum. Attenuated Q _{IN} (cfs) | Velocity In (fps) | Cum. Attenuated Q _{OUT} (cfs) | Velocity Out (fps) | |
| E-5A | 14 | 881.10 | 6.56 | 6.56 | 15, 12 | 881.10 | 6.56 | 4.58 | 6.56 | 5.83 | 18 |
| E-5B | 28 | 691.92 | 5.30 | 4.39 | 15 | 1573.02 | 6.56 | 5.46 | 10.95 | 6.65 | 24 |
| E-5C | 44 | 1904.28 | 12.97 | 11.23 | 24 | 3477.30 | 10.95 | 4.84 | 22.18 | 5.57 | 30 |
| E-5D | 112 | 174.80 | 1.60 | 0.99 | 12 | 3652.11 | 22.18 | 5.48 | 23.18 | 5.58 | 30 |
| Manhole | 120 | | | | | | | | | | 36 |
| E-5E | 141 | 404.14 | 3.31 | 2.28 | 15 | 4056.25 | 23.18 | 5.78 | 25.46 | 5.70 | 36 |
| E-5F | 148 | 175.96 | 1.61 | 0.99 | 12 | 4232.21 | 25.46 | 5.58 | 26.45 | 5.76 | 36 |
| E-5G | 156 | 169.55 | 1.56 | 0.95 | 12 | 4401.76 | 26.45 | 5.69 | 27.39 | 5.81 | 36 |
| E-5H | 164 | 98.72 | 0.98 | 0.55 | 12 | 4500.48 | 27.39 | 5.77 | 27.94 | 5.83 | 36 |
| E-4 | 251 | 3487.29 | 22.24 | 18.87 | 36 | 7987.77 | 27.94 | 5.05 | 46.82 | 5.54 | 48 |
| Manhole | 257 | | | | | | | | | | 54 |
| E-3A | 264 | 3804.61 | 24.04 | 19.77 | 36 | 11792.38 | 46.82 | 4.66 | 66.59 | 5.60 | 54 |
| E-3B | 368 | 600.68 | 4.69 | 3.07 | 18 | 12393.06 | 66.59 | 5.50 | 69.66 | 5.63 | 54 |
| E-2 | 388 | 1816.94 | 12.44 | 9.21 | 24 | 14210.00 | 69.66 | 5.23 | 78.86 | 5.54 | 54 |
| E-1 | 482 | 1485.02 | 10.40 | 7.45 | 24 | 15695.02 | 78.86 | 5.45 | 86.32 | 4.79 | 66 |
| E-11 | 493 | 1790.84 | 12.28 | 8.91 | 30 | 17485.86 | 86.32 | 5.09 | 95.23 | 4.89 | 72 |
| E-12 | 530 | 325.32 | 2.74 | 1.61 | 24 | 17811.18 | 95.23 | 4.75 | 96.84 | 4.93 | 72 |

4.2 Trunk Sewer Model Run No. 2

Trunk Sewer Model Run No. 2 evaluates the flow from the west side and the lower east side of the basin which is identified as Subbasin E-6. This model run includes the Tier I and Tier II areas to be served as described in the City's *Wastewater Facilities Plan Update*, October 2002 as shown in Figures 5 and 6. Additionally, this model run includes the areas defined in the Scope of Services to be served by the trunk sewer.

The trunk sewer alignment on the west side of the basin is the same as Model Run No. 1. The primary difference between this model run and Model Run No. 1 is that the flows from subbasin E-6 is introduced at a node near Fletcher Avenue at Junction Structure E-11/E-6 through a 36-inch diameter sewer. To cross the creek at this location it appears that a siphon would be required for the 36-inch diameter sewer from Subbasin E-6.

Table 6 lists each junction structure, as well as the pipe size of the trunk sewer, inflow and subbasin area associated with each junction structure. Pipe sizes for this model run range from 18 inches at the upstream end to 72 inches at the NE WWTP. The detailed results of this model run are shown in Appendix C.

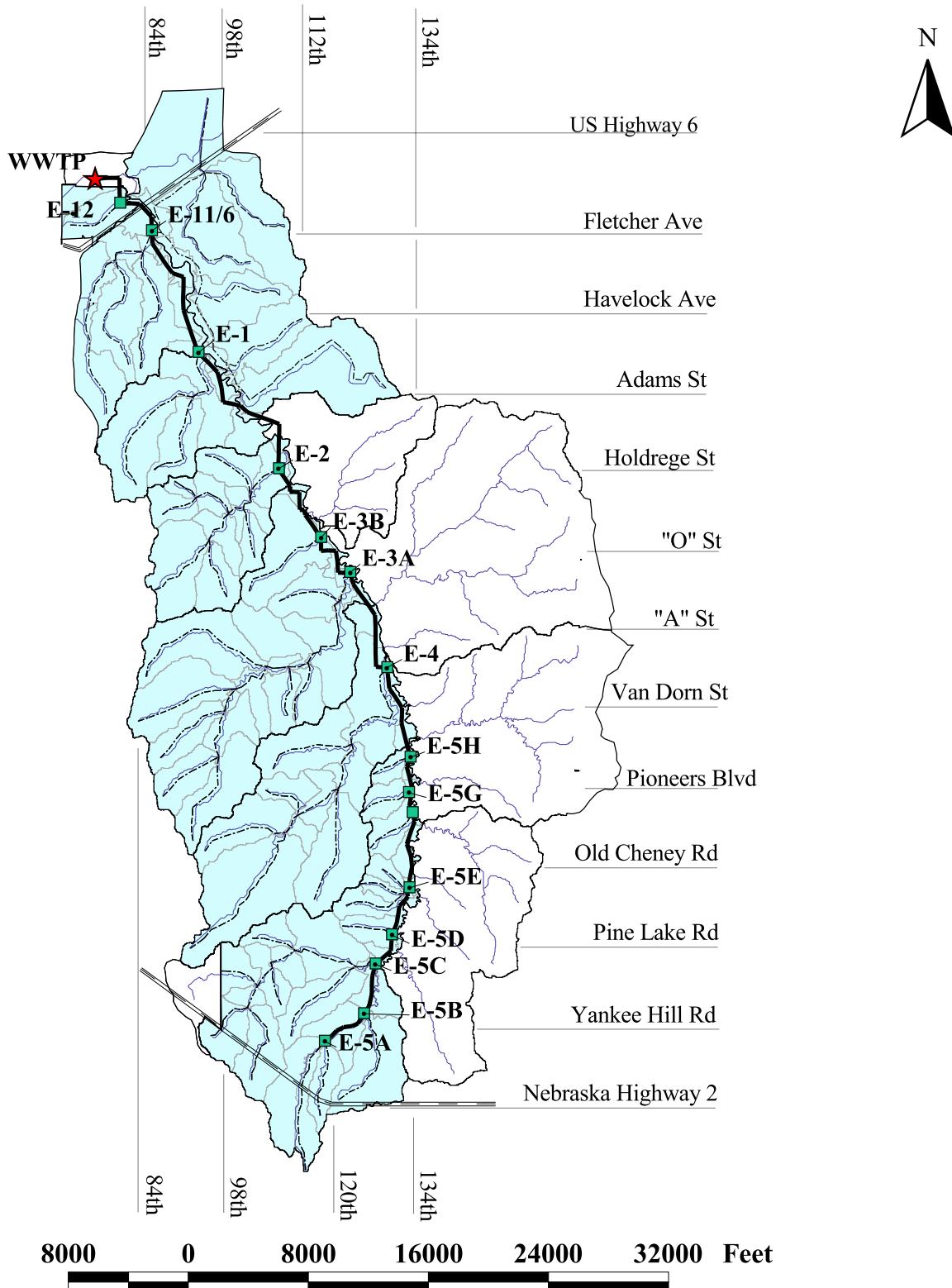


Figure 5
MODEL RUN NO. 2 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

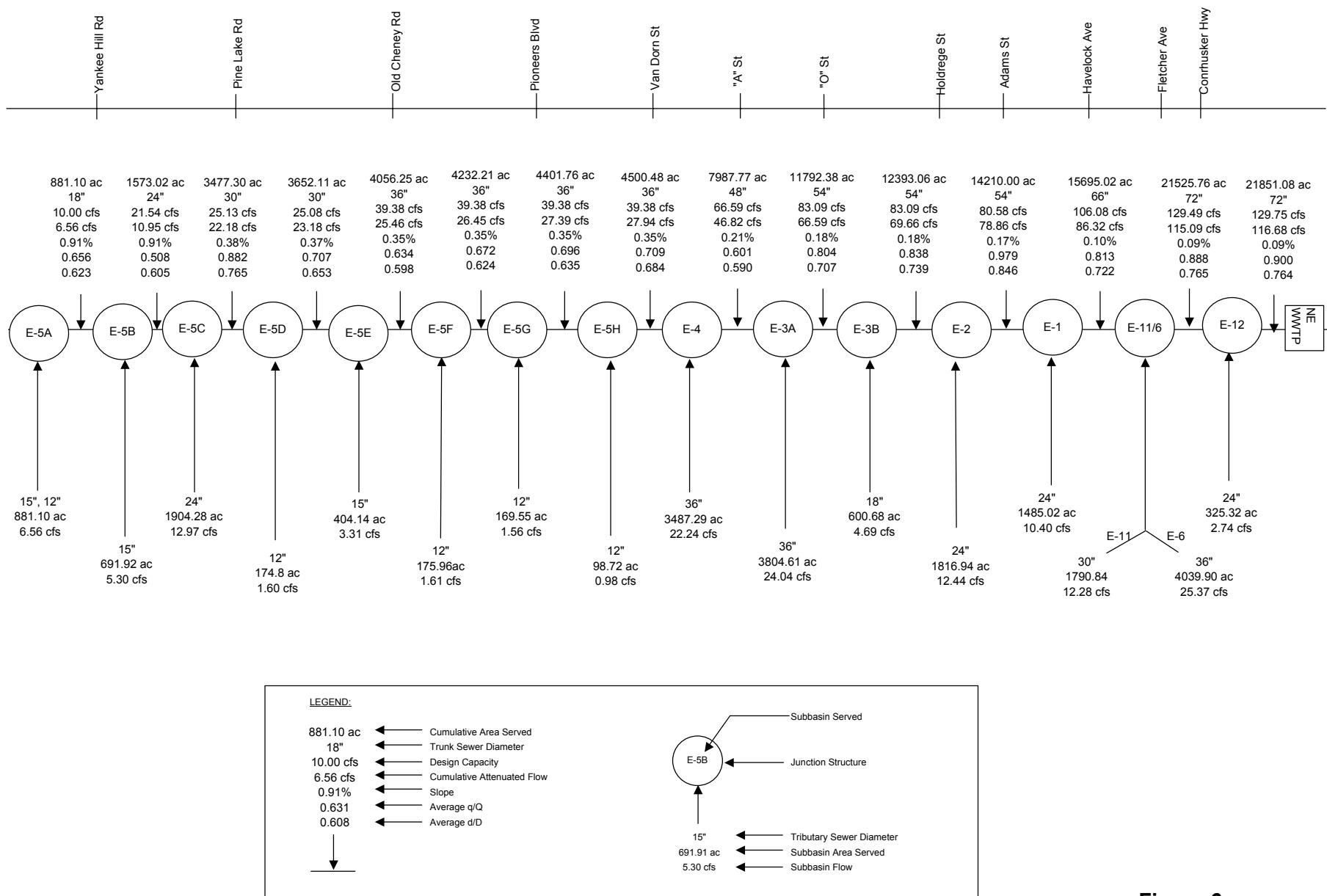


Figure 6
MODEL RUN NO. 2 FLOW SCHEMATIC
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

Table 6
Model Run No. 2 – Westside plus Subbasin E-6
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska

| Jct Box/ Manhole | Node # | Individual Sub Basins | | | Trunk Sewer | | | | | | Pipe Dia. Out (in.) |
|---------------------|-----------|------------------------------|----------------------|------------------------------------|---------------------------------|-----------------------------------|---|----------------------|--|-----------------------|------------------------------|
| | | Sub Basin Area (acres) | Sub Basin Q (cfs) | Attenuated Sub Basin Q (cfs) | Sub Basin Pipe Dia. (in.) | Cum. Area Served (acres) | Cum. Attenuated Q _{IN} (cfs) | Velocity In (fps) | Cum. Attenuated Q _{OUT} (cfs) | Velocity Out (fps) | |
| E-5A | 14 | 881.10 | 6.56 | 6.56 | 15, 12 | 881.10 | 6.56 | 4.58 | 6.56 | 5.83 | 18 |
| E-5B | 28 | 691.92 | 5.30 | 4.39 | 15 | 1573.02 | 6.56 | 5.46 | 10.95 | 6.65 | 24 |
| E-5C | 44 | 1904.28 | 12.97 | 11.23 | 24 | 3477.30 | 10.95 | 4.84 | 22.18 | 5.57 | 30 |
| E-5D | 112 | 174.80 | 1.60 | 0.99 | 12 | 3652.11 | 22.18 | 5.48 | 23.18 | 5.58 | 30 |
| Manhole | 120 | | | | | | | | | | 36 |
| E-5E | 141 | 404.14 | 3.31 | 2.28 | 15 | 4056.25 | 23.18 | 5.78 | 25.46 | 5.70 | 36 |
| E-5F | 148 | 175.96 | 1.61 | 0.99 | 12 | 4232.21 | 25.46 | 5.58 | 26.45 | 5.76 | 36 |
| E-5G | 156 | 169.55 | 1.56 | 0.95 | 12 | 4401.76 | 26.45 | 5.69 | 27.39 | 5.81 | 36 |
| E-5H | 164 | 98.72 | 0.98 | 0.55 | 12 | 4500.48 | 27.39 | 5.77 | 27.94 | 5.83 | 36 |
| E-4 | 251 | 3487.29 | 22.24 | 18.87 | 36 | 7987.77 | 27.94 | 5.05 | 46.82 | 5.54 | 48 |
| Manhole | 257 | | | | | | | | | | 54 |
| E-3A | 264 | 3804.61 | 24.04 | 19.77 | 36 | 11792.38 | 46.82 | 4.66 | 66.59 | 5.60 | 54 |
| E-3B | 368 | 600.68 | 4.69 | 3.07 | 18 | 12393.06 | 66.59 | 5.50 | 69.66 | 5.63 | 54 |
| E-2 | 388 | 1816.94 | 12.44 | 9.21 | 24 | 14210.00 | 69.66 | 5.23 | 78.86 | 5.54 | 54 |
| E-1 | 482 | 1485.02 | 10.40 | 7.45 | 24 | 15695.02 | 78.86 | 5.45 | 86.32 | 4.79 | 66 |
| E-11 | 493 | 5830.74 | 37.65 | 28.77 | 36, 30 | 21525.76 | 86.32 | 5.09 | 115.09 | 4.89 | 72 |
| E-12 | 530 | 325.32 | 2.74 | 1.61 | 24 | 21851.08 | 115.09 | 4.75 | 116.68 | 4.93 | 72 |

4.3 Trunk Sewer Model Run No. 3

Trunk Sewer Model Run No. 3 evaluates the combination of flows from the entire basin (both the west and east sides) and serves all of the Tier I, Tier II, and Tier III zones as shown in Figures 7 and 8. The flows from the east side of the basin would enter the west side trunk basin sewer near Fletcher Avenue at Junction Structure E-11/E-6 through a 66-inch diameter sewer. To get under Stevens Creek at this location it appears that a siphon would be required on the 66-inch diameter sewer from the east side.

Table 7 lists each junction structure, as well as the pipe size of the west side trunk sewer, inflow and subbasin area associated with each junction structure. Pipe sizes for this model run range from 18 inches at the upstream end to 84 inches at the NE WWTP. The detailed results of this model run are shown in Appendix E. This model run indicated that an 84-inch diameter pipe would be required from Fletcher Avenue to the NE WWTP to convey the total flow from the basin.

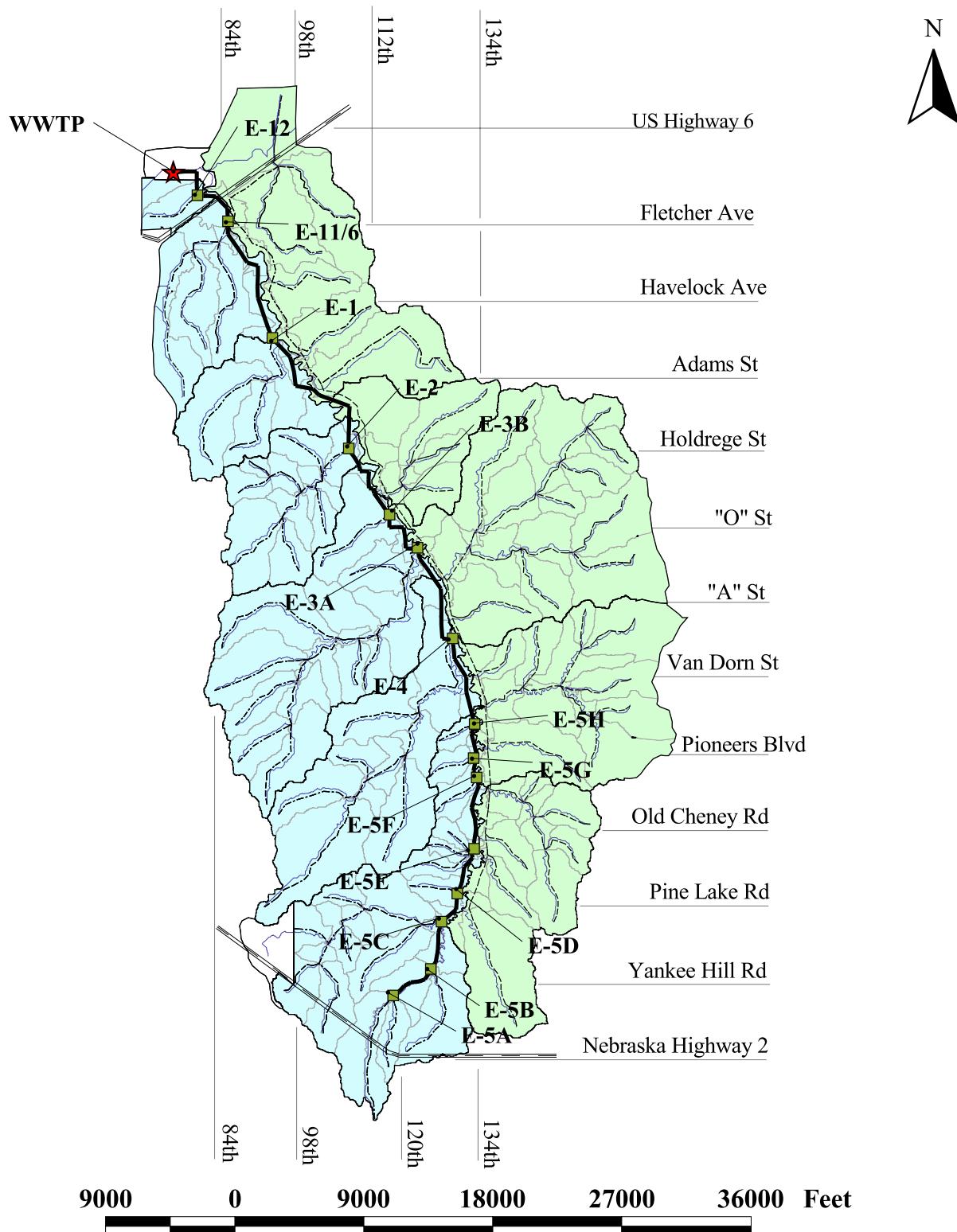


Figure 7
MODEL RUN NO. 3 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

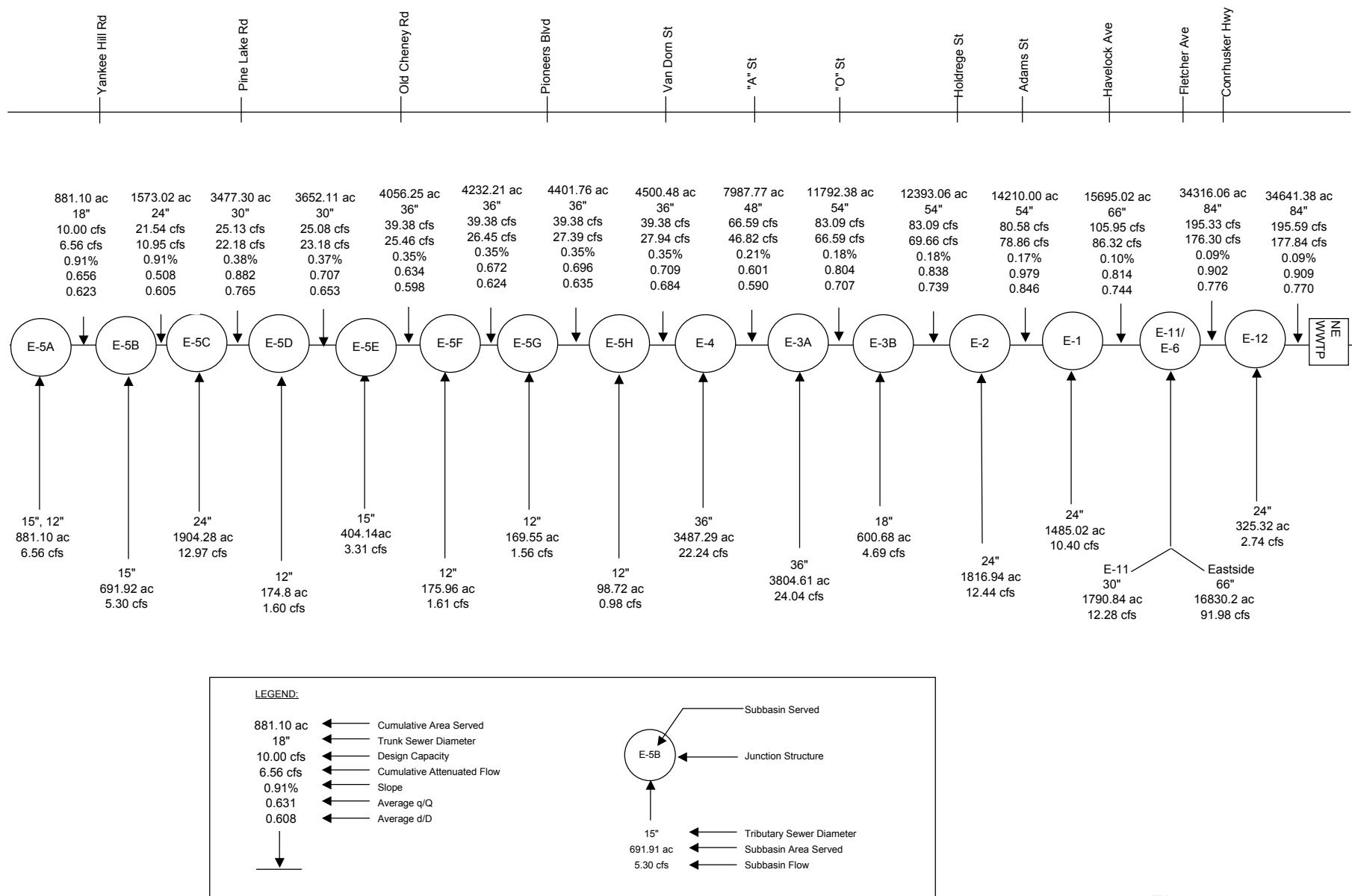


Figure 8
MODEL RUN NO. 3 FLOW SCHEMATIC
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

Table 7
Model Run No. 3 – Westside plus Subbasin E-6 & Eastside Subbasins
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska

| Jct Box/ Manhole | Node # | Individual Sub Basins | | | Trunk Sewer | | | | | | |
|---------------------|-----------|------------------------------|----------------------|------------------------------------|---------------------------------|-----------------------------------|---|----------------------|--|-----------------------|------------------------------|
| | | Sub Basin Area (acres) | Sub Basin Q (cfs) | Attenuated Sub Basin Q (cfs) | Sub Basin Pipe Dia. (in.) | Cum. Area Served (acres) | Cum. Attenuated Q _{IN} (cfs) | Velocity In (fps) | Cum. Attenuated Q _{OUT} (cfs) | Velocity Out (fps) | Pipe Dia. Out (in.) |
| E-5A | 14 | 881.10 | 6.56 | 6.56 | 15, 12 | 881.10 | 6.56 | 4.58 | 6.56 | 5.83 | 18 |
| E-5B | 28 | 691.92 | 5.30 | 4.39 | 15 | 1573.02 | 6.56 | 5.46 | 10.95 | 6.65 | 24 |
| E-5C | 44 | 1904.28 | 12.97 | 11.23 | 24 | 3477.30 | 10.95 | 4.84 | 22.18 | 5.57 | 30 |
| E-5D | 112 | 174.80 | 1.60 | 0.99 | 12 | 3652.11 | 22.18 | 5.48 | 23.18 | 5.58 | 30 |
| Manhole | 120 | | | | | | | | | | 36 |
| E-5E | 141 | 404.14 | 3.31 | 2.28 | 15 | 4056.25 | 23.18 | 5.78 | 25.46 | 5.70 | 36 |
| E-5F | 148 | 175.96 | 1.61 | 0.99 | 12 | 4232.21 | 25.46 | 5.58 | 26.45 | 5.76 | 36 |
| E-5G | 156 | 169.55 | 1.56 | 0.95 | 12 | 4401.76 | 26.45 | 5.69 | 27.39 | 5.81 | 36 |
| E-5H | 164 | 98.72 | 0.98 | 0.55 | 12 | 4500.48 | 27.39 | 5.77 | 27.94 | 5.83 | 36 |
| E-4 | 251 | 3487.29 | 22.24 | 18.87 | 36 | 7987.77 | 27.94 | 5.05 | 46.82 | 5.54 | 48 |
| Manhole | 257 | | | | | | | | | | 54 |
| E-3A | 264 | 3804.61 | 24.04 | 19.77 | 36 | 11792.38 | 46.82 | 4.66 | 66.59 | 5.60 | 54 |
| E-3B | 368 | 600.68 | 4.69 | 3.07 | 18 | 12393.06 | 66.59 | 5.50 | 69.66 | 5.63 | 54 |
| E-2 | 388 | 1816.94 | 12.44 | 9.21 | 24 | 14210.00 | 69.66 | 5.23 | 78.86 | 5.54 | 54 |
| E-1 | 482 | 1485.02 | 10.40 | 7.45 | 24 | 15695.02 | 78.86 | 5.45 | 86.32 | 4.79 | 66 |
| E-11 | 493 | 18621.04 | 104.26 | 89.99 | 66, 30 | 34316.06 | 86.32 | 4.47 | 176.30 | 5.08 | 84 |
| E-12 | 530 | 325.32 | 2.74 | 1.61 | 24 | 34641.38 | 176.30 | 5.50 | 177.84 | 5.54 | 84 |

4.4 Trunk Sewer Model Run No. 4

Trunk Sewer Model Run No. 4 evaluates flows from the whole basin similar to Model Run No. 3 (Tiers I, II and III) as shown in Figures 9 and 10. The difference is that the flows from Subbasin E-6 on the eastside of Stevens Creek enters the west side trunk sewer at Junction Structure E-11/E-6 through a 36-inch diameter sewer. Due to the elevation of the existing headworks at the NE WWTP the 36-inch diameter sewer from Subbasin E-6 would probably require a siphon under Stevens Creek. The flows from the other subbasins (Subbasins E-7, E-8, E-9, E-10) on the east side enter the west side trunk sewer at Junction Structure E-7 located between Adams and Holdrege Street through a 60-inch diameter pipe. At this location it appears that the sewer can cross under the creek without a siphon. This however will be confirmed when an alignment has been selected and ground survey completed.

Table 8 lists each junction structure, as well as the pipe size of the trunk sewer, inflow and subbasin area associated with each junction structure. The detailed results of this model run are located in Appendix G. The Pipe sizes for this model range from 18 inches at the upstream end to 84 inches at the NE WWTP. As expected the west side trunk from Junction Structure E-7 to Junction Structure E-11/E-6 at Fletcher Avenue was increased to carry the east side flows. This resulted in the pipe size increasing from 60-inch to 78-inch between Junction Structures E-7 and E-1 and from 66-inch to 78-inch between Junction Structures E-1 and E-11/E-6.

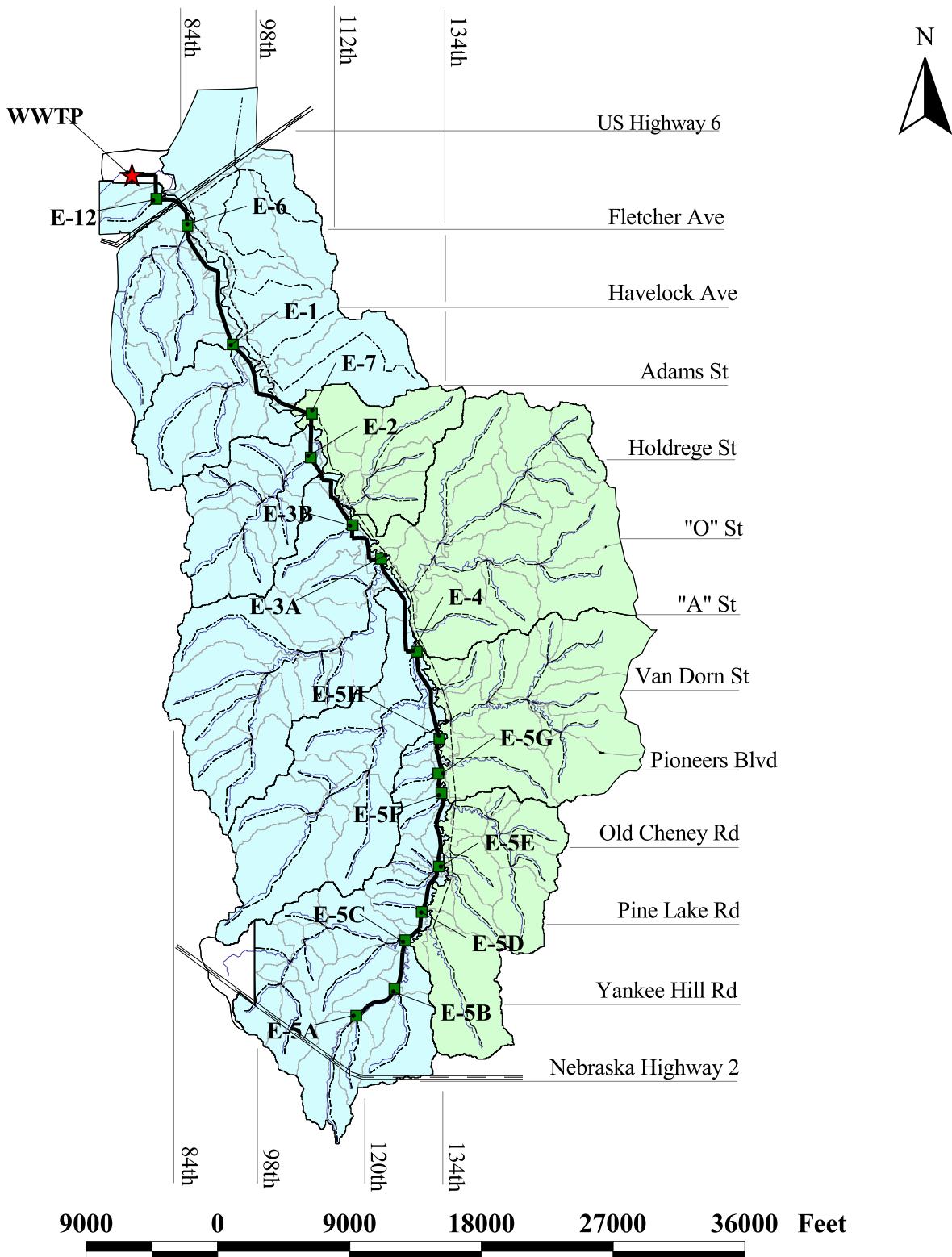


Figure 9
MODEL RUN NO. 4 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

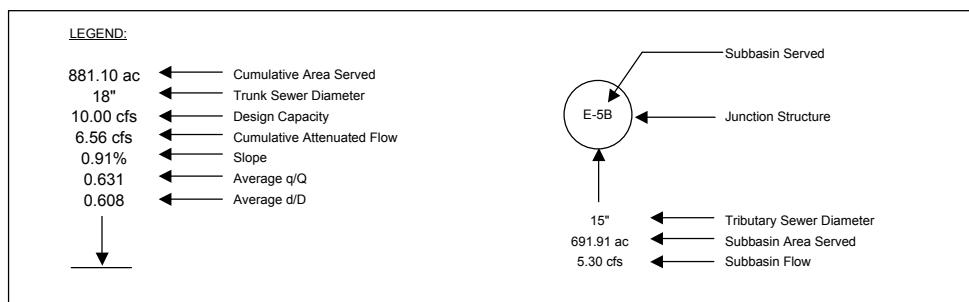
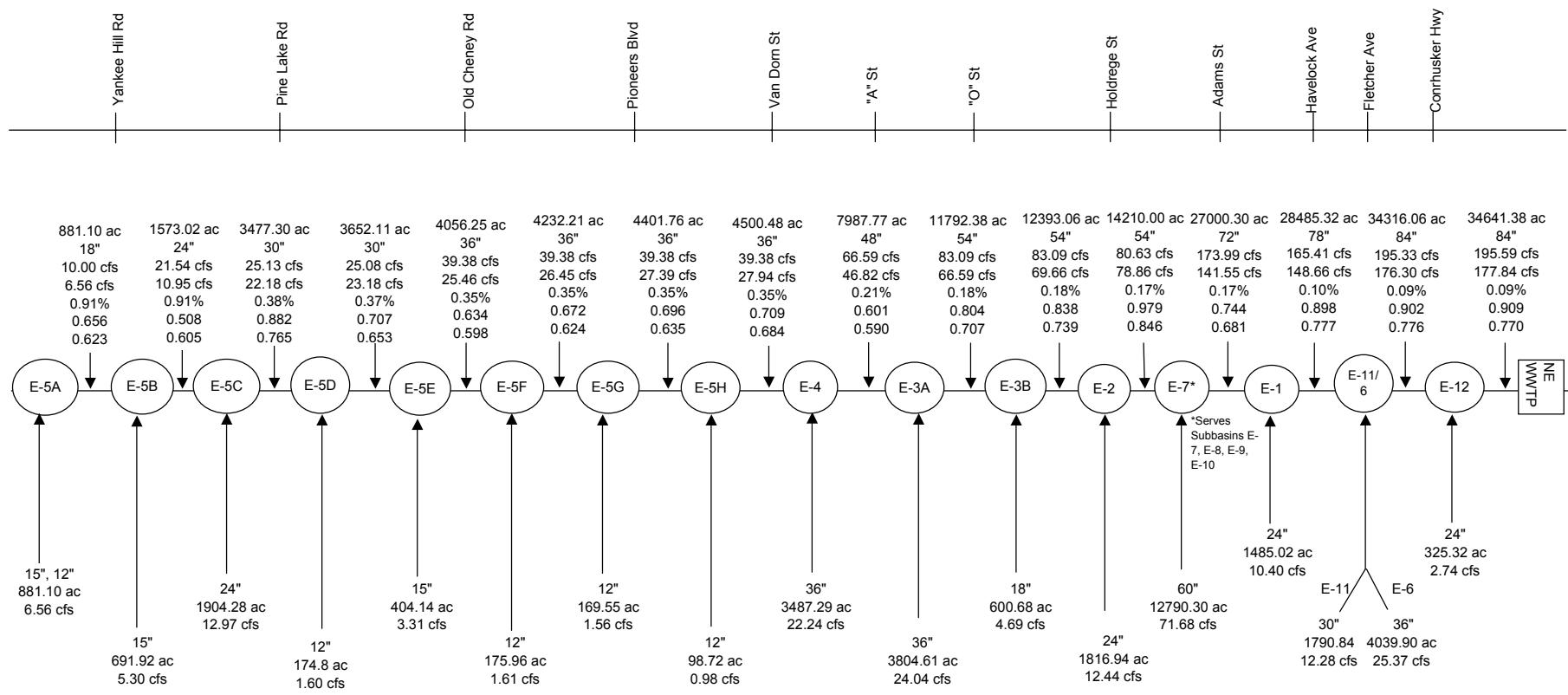


Figure 10
MODEL RUN NO. 4 FLOW SCHEMATIC
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

Table 8
Model Run No. 4 – Westside plus Subbasin E6 with Eastside Subbasins at Jct Box E-7
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska

| Jct Box/ Manhole | Node # | Individual Subbasins | | | | Trunk Sewer | | | | | |
|---------------------|-----------|-----------------------------|---------------------|-----------------------------------|--------------------------------|-----------------------------------|---|----------------------|--|-----------------------|------------------------------|
| | | Subbasin Area (acres) | Subbasin Q (cfs) | Attenuated Subbasin Q (cfs) | Subbasin Pipe Dia. (in.) | Cum. Area Served (acres) | Cum. Attenuated Q _{IN} (cfs) | Velocity In (fps) | Cum. Attenuated Q _{OUT} (cfs) | Velocity Out (fps) | Pipe Dia. Out (in.) |
| E-5A | 14 | 881.10 | 6.56 | 6.56 | 15, 12 | 881.10 | 6.56 | 4.58 | 6.56 | 5.83 | 18 |
| E-5B | 28 | 691.92 | 5.30 | 4.39 | 15 | 1573.02 | 6.56 | 5.46 | 10.95 | 6.65 | 24 |
| E-5C | 44 | 1904.28 | 12.97 | 11.23 | 24 | 3477.30 | 10.95 | 4.84 | 22.18 | 5.57 | 30 |
| E-5D | 112 | 174.80 | 1.60 | 0.99 | 12 | 3652.11 | 22.18 | 5.48 | 23.18 | 5.58 | 30 |
| Manhole | 120 | | | | | | | | | | 36 |
| E-5E | 141 | 404.14 | 3.31 | 2.28 | 15 | 4056.25 | 23.18 | 5.78 | 25.46 | 5.70 | 36 |
| E-5F | 148 | 175.96 | 1.61 | 0.99 | 12 | 4232.21 | 25.46 | 5.58 | 26.45 | 5.76 | 36 |
| E-5G | 156 | 169.55 | 1.56 | 0.95 | 12 | 4401.76 | 26.45 | 5.69 | 27.39 | 5.81 | 36 |
| E-5H | 164 | 98.72 | 0.98 | 0.55 | 12 | 4500.48 | 27.39 | 5.77 | 27.94 | 5.83 | 36 |
| E-4 | 251 | 3487.29 | 22.24 | 18.87 | 36 | 7987.77 | 27.94 | 5.05 | 46.82 | 5.54 | 48 |
| Manhole | 257 | | | | | | | | | | 54 |
| E-3A | 264 | 3804.61 | 24.04 | 19.77 | 36 | 11792.38 | 46.82 | 4.66 | 66.59 | 5.60 | 54 |
| E-3B | 368 | 600.68 | 4.69 | 3.07 | 18 | 12393.06 | 66.59 | 5.50 | 69.66 | 5.63 | 54 |
| E-2 | 388 | 1816.94 | 12.44 | 9.21 | 24 | 14210.00 | 69.66 | 5.23 | 78.86 | 5.54 | 54 |
| E-7 | 442 | 12790.30 | 71.68 | 62.69 | 60 | 27000.30 | 78.86 | 5.23 | 141.55 | 7.03 | 72 |
| Manhole | 448 | | | | | | | | | | 78 |
| E-1 | 482 | 1485.02 | 10.40 | 7.11 | 24 | 28485.32 | 141.55 | 5.81 | 148.66 | 5.43 | 78 |
| E-11/E-6 | 525 | 5830.74 | 37.65 | 27.65 | 36, 30 | 34316.06 | 148.66 | 5.19 | 176.30 | 5.52 | 84 |
| E-12 | 530 | 325.32 | 2.74 | 1.53 | 24 | 34641.38 | 176.30 | 5.50 | 177.84 | 5.54 | 84 |

4.5 Trunk Sewer Model Run No. 5

Model Run No. 5 was prepared to evaluate two primary parameters. The first is to determine what size of a parallel sewer would be required to serve the east side of the basin completely separately from the west side. The second is to determine what the difference in 2004 dollars to install two parallel sewers versus one larger sewer from Fletcher Avenue to the NE WWTP, as depicted in Model Run No. 3.

Trunk Sewer Model Run No. 5 evaluates a trunk sewer running parallel with the main trunk sewer (Model Run No. 1) along the east side of Stevens Creek. This east trunk collects flow from each of the subbasins on the east side of the creek, including Subbasins E-6 through E-10, and drains directly to the NE WWTP without combining with the west trunk sewer as shown in Figures 11 and 12. With the two parallel trunk sewers serving both sides of Stevens Creek, the west trunk sewer ranges in pipe size from 18-inches to a 72-inches (from Model Run No. 1), and the east trunk sewer would require pipe sizes from an 18-inch on its upstream end to a 66-inch at the NE WWTP. However, in order to reach the NE WWTP which is located on the west side of Stevens Creek, the east trunk sewer must cross to the west side of the creek. The detailed modeling results of the east main trunk are located in Appendix I. It should be noted that the eastside sewer could need to be constructed at a deeper invert elevation to avoid the costs of a siphon under Stevens Creek. Based on existing data it appears that the sewer will need to be 7 feet deeper at the NE WWTP to avoid the aforementioned siphon. It is recommended that this assumption be verified during preliminary design.

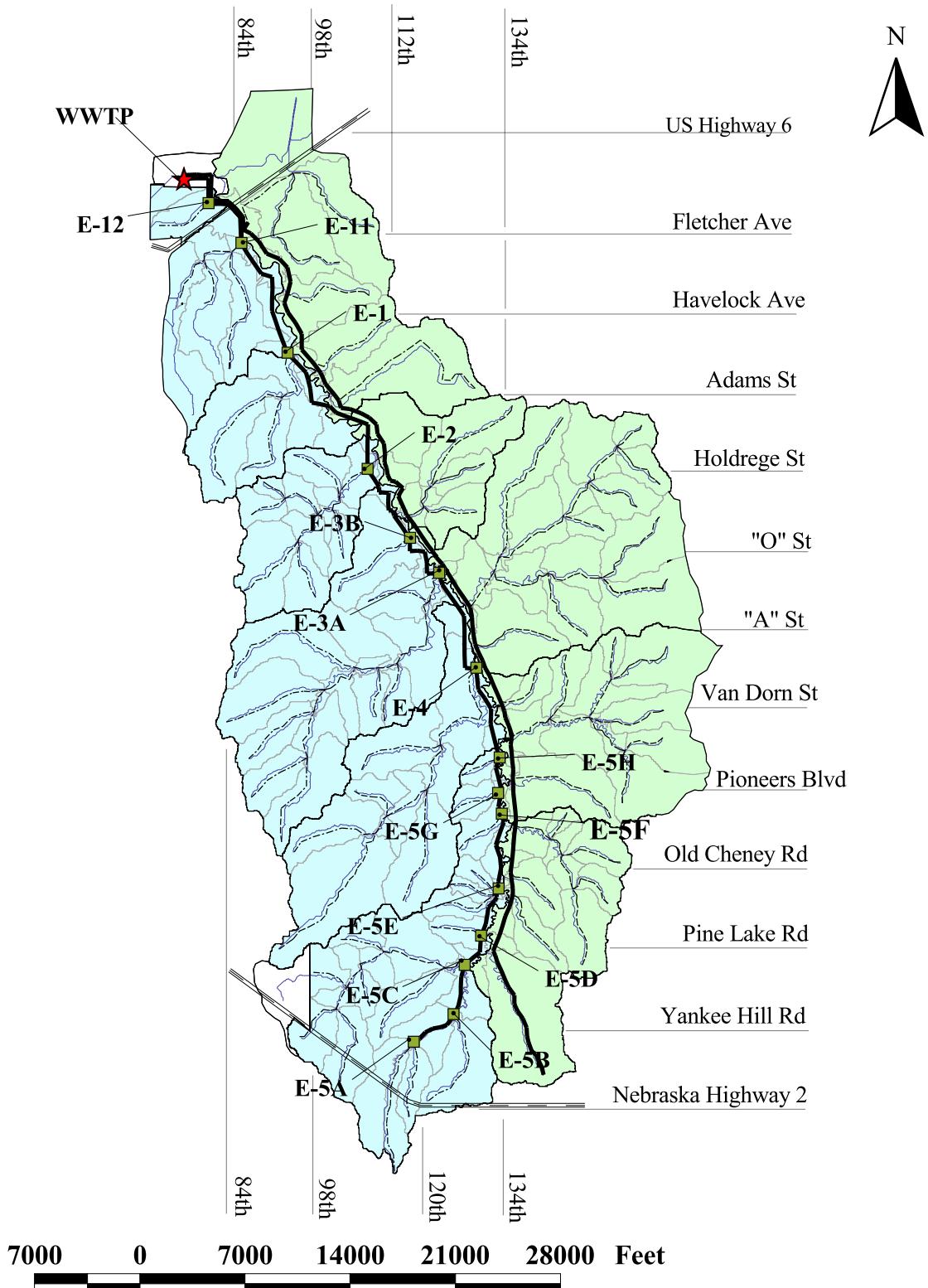


Figure 11
MODEL RUN NO. 5 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

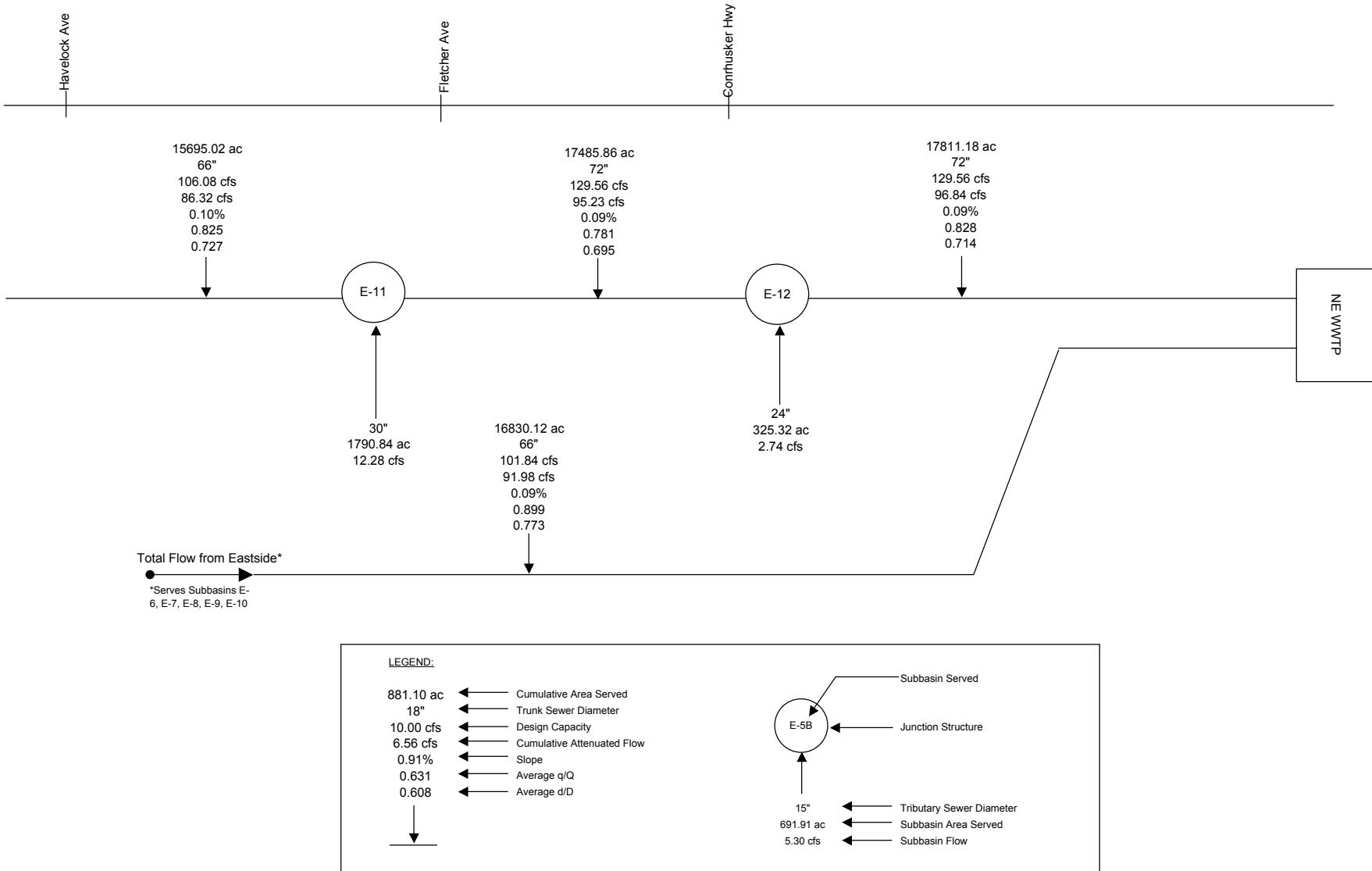


Figure 12
MODEL RUN NO. 5 FLOW SCHEMATIC
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

4.6 Subbasin E-2 Sewer Model Run

The LPSNRD has indicated that a dam and impoundment will be constructed on the Subbasin E-2 tributary just upstream from Stevens Creek. The actual location and dimensions of the dam and impoundment are unknown at this time. In addition to the dam and impoundments there are plans to develop parts of this subbasin. The unknowns associated with both of these subjects should be further defined prior to an actual alignment being selected.

For the purpose of selecting a preliminary pipe size the subbasin was modeled. This tributary sewer generally proceeds from 98th Street and "O" Street to Junction Structure E-2. For the purpose of sizing the proposed Subbasin E-2 sewer, thirteen sub-subbasins were delineated within the subbasin boundary. The sub-subbasin areas ranged between 23 and 455 acres. The total area of Subbasin E-2 is approximately 1,817 acres. The pipe sizes for this tributary sewer, from Junction Structure A and Junction Structure E-2, are 18 and 24 inches. Four Junction Structures A, B, C, D and E were placed along the main trunk within Subbasin E-2 at each point where a tributary branch sewer intersected the main trunk. Table 9 lists each junction structure, as well as the pipe size, inflow, and sub-subbasin area associated with each junction structure. The detailed results of this model run are shown in Appendix K.

N

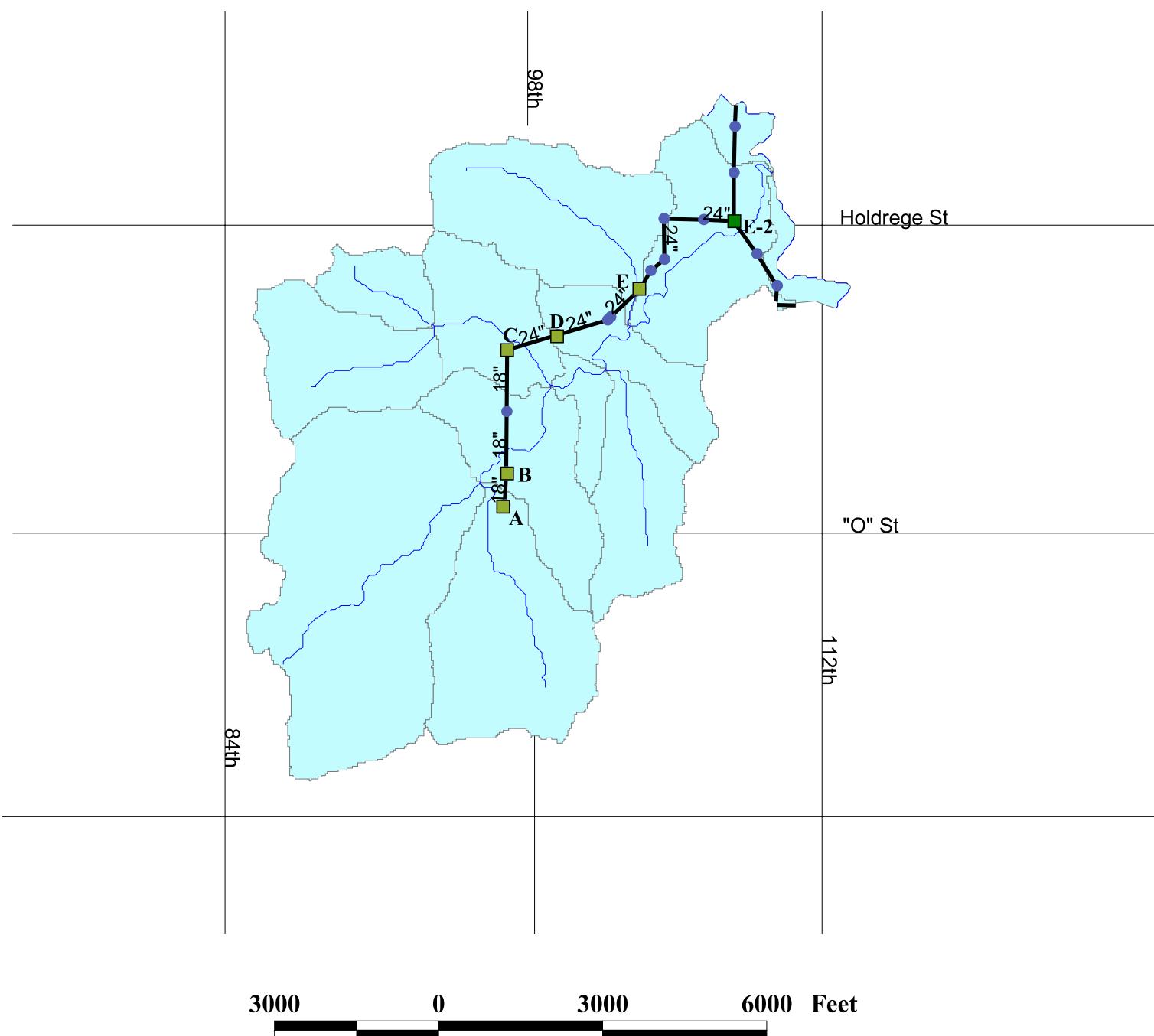



Figure 13
SUBBASIN E-2 PLAN VIEW
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

Table 9
Model Run Subbasin E-2
Stevens Creek Basin Trunk Sewer
City of Lincoln, Nebraska

| Jct Box/ Manhole | Node # | Individual Sub Basins | | | Trunk Sewer | | | | | |
|---------------------|-----------|------------------------------|----------------------|------------------------------------|--------------------------------|---|----------------------|--|-----------------------|------------------------|
| | | Sub Basin Area (acres) | Sub Basin Q (cfs) | Attenuated Sub Basin Q (cfs) | Cum. Area Served (acres) | Cum. Attenuated Q _{IN} (cfs) | Velocity In (fps) | Cum. Attenuated Q _{OUT} (cfs) | Velocity Out (fps) | Pipe Dia. Out (in.) |
| A | N12 | 685.3 | 5.26 | 6.56 | 685.30 | 5.26 | - | 5.26 | 5.88 | 18 |
| B | N11 | 150.09 | 1.40 | 1.00 | 835.39 | 5.26 | 5.88 | 6.26 | 5.88 | 18 |
| C | N9 | 312.09 | 2.64 | 2.02 | 1147.48 | 6.26 | 4.97 | 8.28 | 5.02 | 24 |
| D | N8 | 249.68 | 2.18 | 1.57 | 1397.16 | 8.28 | 5.02 | 9.86 | 5.54 | 24 |
| E | N5 | 419.79 | 3.42 | 2.58 | 1816.95 | 9.86 | 5.11 | 12.44 | 5.84 | 24 |

4.7 Probable Opinion of Estimated Project Costs

The preliminary cost estimates developed in this technical memorandum represent an order of magnitude cost estimate. All of the cost estimates presented are based on the first quarter of the year 2004. An order of magnitude estimate is considered a reconnaissance level estimate. The estimated costs are approximate because they are developed without detailed engineering data. Order of magnitude costs may be estimated using cost-capacity curves, scaling factors, ratios, and information from other projects.

The probable opinion of estimated Project Costs for the first four model runs have been tabularized as shown in Table 10 below. The results are as expected with the model runs that incorporate larger areas being the least cost effective. These costs include allowances based on a percentage of the estimated construction costs as outlined below:

- 25 percent estimating contingency.
- 20 percent for engineering and administrative fees.
- 10 percent for general conditions.
- Right of way and Easements have been included.

| Table 10 Preliminary Costs ^{(1) (2)} for Model Runs 1 Through 4 Stevens Creek Basin Trunk Sewer City of Lincoln, Nebraska | | | | | |
|---|--|---|--|--|--|
| Model Run | Phase I NE WWTP To Fletcher | Phase II Fletcher to Murdock Trail⁽³⁾ | Phase III Murdock Trail⁽³⁾ To Holdrege | Phase IV Holdrege To “O” Street⁽⁴⁾ | Phases V - IX Holdrege To Yankee Hill |
| 1 | 7,700 lf 72" Ø Pipe \$10,200,000 | 9,300 lf 66" Ø Pipe \$10,600,000 | 11,000 lf 54" Ø Pipe \$9,200,000 | 7,600 lf 24" Ø Pipe \$2,900,000 | 45,750 lf 54" to 18" Ø \$27,200,000 |
| 2 | 7,700 lf 72" Ø Pipe \$10,200,000 | 9,300 lf 66" Ø Pipe \$10,600,000 | 11,000 lf 54" Ø Pipe \$9,200,000 | 7,600 lf 24" Ø Pipe \$2,900,000 | 45,750 lf 54" to 18" Ø \$27,200,000 |
| 3 | 7,700 lf 84" Ø Pipe \$12,300,000 | 9,300 lf 66" Ø Pipe \$10,600,000 | 11,000 lf 60" Ø Pipe \$9,200,000 | 7,600 lf 24" Ø Pipe \$2,900,000 | 45,750 lf 54" to 18" Ø \$27,200,000 |
| 4 | 7,700 lf 78" to 84" Ø \$12,000,000 | 9,300 lf 78" Ø Pipe \$12,700,000 | 11,000 lf 54 - 64" Ø \$13,300,000 | 7,600 lf 24" Ø Pipe \$2,900,000 | 45,750 lf 54" to 18" Ø \$27,200,000 |

(1) Year 2004 costs.

(2) Costs include easements, engineering, legal and estimating contingencies

(3) The Murdock Trail is located approximately half way between Havelock and Adams

(4) Phase IV is the trunk sewer that serves to Subbasin E-2.

4.8 Summary of Modeling Results

4.8.1 Model Run No. 1

This model serves the Westside only and is the base that the other models build upon. The probable opinion of estimated project costs associated with this model run is approximately \$60,000,000. These costs include the estimated construction costs for the Subbasin E-2 sewer (Phase IV). A breakdown of the cost estimate is located in Appendix B.

4.8.2 Model Run No. 2

The probable opinion of estimated project costs for this model run is approximately \$60,000,000. These costs include the estimated construction costs for the Subbasin E-2 sewer (Phase IV). The primary difference between Model Run No. 2 and Model Run No. 1 is the additional flow from Subbasin E-6 that enters the trunk sewer near Fletcher Avenue. The 72-inch diameter trunk, as determined in Model Run No. 1, is shown to have enough available capacity to handle the additional inflow from Subbasin E-6. This resulted in no increase in estimated project costs over Model Run No. 1. A breakdown of the cost estimate is located in Appendix D.

4.8.3 Model Run No. 3

The probable opinion of estimated project costs for Model Run No. 3 is approximately \$62,200,000. This revealed that the estimated costs to increase the Phase I pipe from a 72-inch diameter (Model Runs No. 1 and 2) to an 84-inch diameter is approximately \$2,000,000. A detailed breakdown of this cost estimate is presented in Appendix F.

4.8.4 Model Run No. 4

The probable opinion of estimated project costs for this model run is approximately \$68,100,000. The primary purpose for this model run was to determine the difference in pipe size and associated costs with conveying the flows from the Tier III zones (subbasins E-7, E-8, E-9, and E-10), into the west side trunk sewer farther upstream of the NE WWTP while continuing to take the flows from Subbasin E-6 at Junction Structure E-11/E-6, near Fletcher Avenue. This resulted in an increase in an additional cost of nearly \$6,000,000 as compared to the cost associated with Model Run No. 3. A breakdown of the cost estimate is located in Appendix H.

4.8.5 Model Run No. 5

A cost estimate was performed on the downstream reach, between Fletcher Avenue and the NE WWTP, of this model run and is listed with the cost for the same reach of sewer from Model Run No. 3. The same contingencies and allowances have been used as for the previous model runs. The probable opinion of estimated project costs for the two parallel sewers (between Fletcher Avenue and the NE WWTP) is \$18,900,000. Likewise, the same reach of sewer sized to carry the total flow from both sides of the basin (Model Run No. 3) has an estimated costs of

\$12,300,000. Therefore, based on 2004 dollars, installing one single 84-inch diameter sewer would be more cost effective than install two trunk sewers if they were both installed today. A breakdown of the cost estimate is located in Appendix J.

4.8.6 Subbasin E-2 Model Run

The probable opinion of estimated project costs for this sewer is \$2,900,000. A breakdown of the cost estimate for this model run is located in Appendix L.

5.0 SELECTION OF THE PREFERRED TRUNK SEWER SIZE

5.1 Purpose of Modeling

The primary purpose of this modeling exercise is to select the areas that are to be served by the trunk sewer. The areas to be served by the trunk sewer thereby defines the size of the sewer that will eventually be installed. Two primary methods have been utilized to accomplish this. The first is to select the model run which serves the areas defined in the Scope of Work (Tier I and Tier II). The second method is to select the trunk sewer size based on the years of service that the trunk sewer will provide regardless of the areas served. Each of these two methods is discussed below.

5.2 Selecting the Trunk Sewer Size To Serve Tier I and Tier II

Selecting the size of the trunk sewer based on this method is simply selecting the model run that serves the currently identified Tier I and Tier II planning zones. Using this methodology, Model Run No. 2 would be the selected alternative. This model run reveals that a 72-inch diameter pipe would be required for Phase I project as discussed previously.

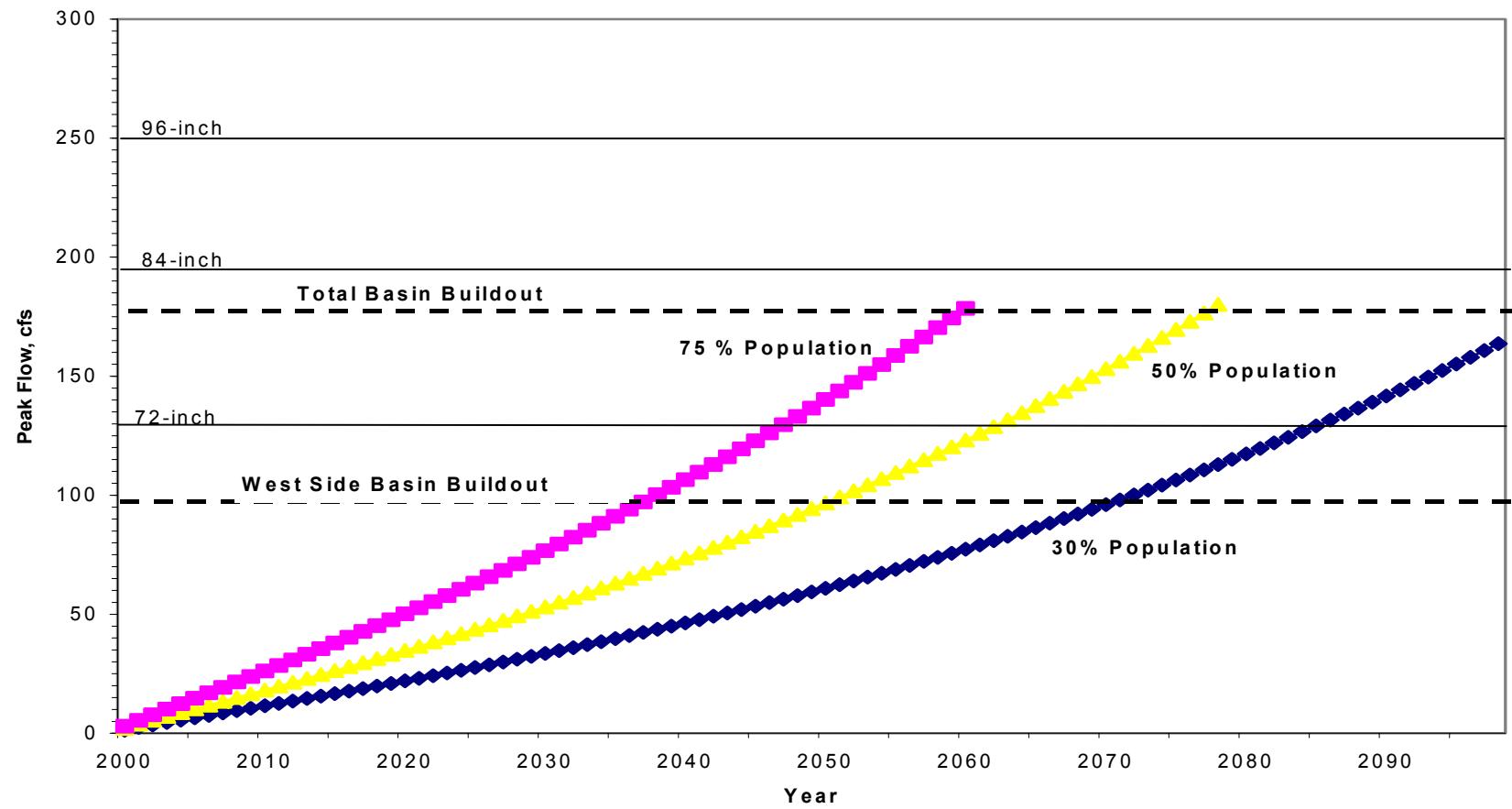
5.3 Selecting the Trunk Sewer Size Based On Estimated Years of Service

For this method the size of the sewer, or model run will be determined based on estimating the years of service that a particular size trunk sewer will have based on new growth in the Stevens Creek Basin. To determine the growth in the basin the City population in the year 2001 was projected at a growth rate of 1.5 % per year as identified in the *Wastewater Facility Master Plan, October 2002*. Since it is not logical that all of the new growth will occur in the Stevens Creek Basin three different growth scenarios have been delineated. These growth scenarios are based assuming a percentage of the new growth will locate in the basin. The three growth scenarios that have been evaluated shown are:

- 30 percent of the new growth will reside in Stevens Creek Basin
- 50 percent of the new growth will reside in Stevens Creek Basin, and
- 75 percent of the new growth will reside in Stevens Creek Basin.

Based on the growth assumptions stated above a graphical representation of the wastewater flows, pipe size capacity, and years of service has been prepared as shown in Figure 14. The

two different Phase I pipe sizes shown in the figure are a 72-inch pipe (as identified in Model Run Nos. 1 and 2), and an 84-inch pipe (as identified in Model Run Nos. 3 and 4).



Notes:

- 1- Flow is based on 7.2 people per acre per City Planning
- 2- The City's flow equation was used to calculate flows
- 3 - Pipe sizes were based on 5 ft/sec which generally correlates with the dynamic modeling results
- 4 - "Total Basin Buildout" includes both the west and east sides of the basin
- 5 - "West Side Basin Buildout" includes the area on the west side of the basin
- 6 - 30%, 50%, and 75% Population indicates the percentage of growth that locates to the Stevens Creek Basin
- 7 - Population growth rate used was 1.5% based on the Wastewater Facilities Plan Update, October 2002.
- 8- 66-inch diameter pipe is the smallest size pipe that can be used to maintain adequate cover (to be verified during prelim. design)

Figure 14
PROJECTED PEAK FLOWS VS
PHASE I PIPE SIZE
STEVENS CREEK BASIN TRUNK SEWER
CITY OF LINCOLN, NEBRASKA

These pipes are then compared to the projected basin buildout wastewater flows. These flows are calculated using the projected population growth of 1.5 percent and a population density of 7.2 people per acre (provided by the City Planning Department).

This evaluation revealed that a 72-inch diameter sewer (the same size as selected by method 1 above) at the 75 percent growth curve would reach its capacity in approximately 2045. Likewise, the same pipe would reach its capacity in approximately 2085 at the 30 percent growth rate. An 84-inch pipe has the capacity to serve the entire basin.

Table 11 below details the two primary Phase I pipe sizes as determined by the modeling, and the estimated percentage of the total basin that each will serve.

| Table 11 Phase I – Area Served by Pipe Size Stevens Creek Basin Trunk Sewer City of Lincoln, Nebraska | | |
|---|--------------------------|----------------------------------|
| Pipe Diameter (in.)⁽¹⁾ | Max. Acres Served | % of Total Watershed Area |
| 72 (Model Run Nos. 1 and 2) | 21,850 | 63% |
| 84 (Model Run Nos. 3 and 4) | 34,640 | 100% |

(1) Based on an average d/D of 0.85 - 0.90.

5.4 Recommended Model Run (Trunk Sewer Size)

Based on this analysis it is recommended that the Model Run 2 be adopted for this project. This would result in a Phase I pipe size of 72-inch. The following are the primary reasons for this recommendation:

- This model run and associated pipe size provides the needed capacity to serve the Tier I and Tier II areas of the basin as defined in the *Wastewater Facilities Plan Update*, October 2002, and the Scope of Work.
- Based on the above analysis a 72-inch diameter pipe would provide as a minimum approximately 40 years of service before another parallel pipe would be required.
- As discussed above, the Phase I cost for a 72-inch pipe is less expensive than the corresponding 84-inch pipe. This savings in pipe costs could be used to install additional trunk sewer or used to fund other projects as determined by the City.
- Without surcharging, the pipe will convey approximately 63 percent of the wastewater generated in the total basin as shown above.

As previously stated, it is recommended that the model be refined to reflect the alignment selected and the actual survey information. This will also provide an opportunity to adjust pipe sizes as field conditions dictate.

APPENDIX A

Model Run No. 1 Output

APPENDIX A

XP SWMM RESULTS FOR MODEL RUN NO. 1 (WESTSIDE ONLY)

Westside Only - No Surcharging

| Link Name | Design Full Flow (ft^3/s) | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design Flow | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|---------------------------|------------------------|---------------|-------------------|---------------------|----------------------|-------|-------------|----------------|----------------|
| L1 | 6.152 | 5.013 | 1.25 | 3.860 | 6.781 | 0.627 | 0.593 | 1159.400 | 1395.000 | 1384.486 |
| L2 | 6.151 | 5.013 | 1.25 | 3.850 | 5.624 | 0.626 | 0.590 | 773.700 | 1384.486 | 1377.470 |
| L3 | 6.152 | 5.013 | 1.25 | 3.850 | 5.438 | 0.626 | 0.590 | 610.100 | 1377.470 | 1371.937 |
| L4 | 6.152 | 5.013 | 1.25 | 3.850 | 5.465 | 0.626 | 0.590 | 751.300 | 1371.937 | 1365.124 |
| L5 | 6.152 | 5.013 | 1.25 | 3.850 | 5.219 | 0.626 | 0.590 | 751.400 | 1365.124 | 1358.310 |
| L6 | 6.152 | 5.013 | 1.25 | 3.850 | 5.157 | 0.626 | 0.590 | 462.000 | 1358.310 | 1354.120 |
| L7 | 6.151 | 5.012 | 1.25 | 3.850 | 5.220 | 0.626 | 0.590 | 641.300 | 1354.120 | 1348.305 |
| L8 | 6.152 | 5.013 | 1.25 | 3.850 | 5.272 | 0.626 | 0.590 | 588.300 | 1348.305 | 1342.970 |
| L9 | 6.151 | 5.013 | 1.25 | 3.850 | 8.584 | 0.626 | 0.590 | 744.600 | 1342.970 | 1336.218 |
| L10 | 6.152 | 5.013 | 1.25 | 3.850 | 5.174 | 0.626 | 0.590 | 443.800 | 1336.218 | 1332.193 |
| L11 | 6.151 | 5.013 | 1.25 | 3.850 | 5.337 | 0.626 | 0.591 | 782.000 | 1332.193 | 1325.102 |
| L12 | 6.151 | 5.013 | 1.25 | 3.850 | 8.252 | 0.626 | 0.591 | 690.000 | 1325.102 | 1318.845 |
| L13 | 6.152 | 5.013 | 1.25 | 3.850 | 4.575 | 0.626 | 0.730 | 802.200 | 1318.845 | 1311.570 |
| L22 | 10.002 | 5.660 | 1.50 | 6.560 | 5.827 | 0.656 | 0.609 | 474.400 | 1311.570 | 1307.269 |
| L23 | 10.002 | 5.660 | 1.50 | 6.560 | 5.828 | 0.656 | 0.609 | 573.900 | 1307.269 | 1302.066 |
| L24 | 10.003 | 5.660 | 1.50 | 6.560 | 5.828 | 0.656 | 0.609 | 553.300 | 1302.066 | 1297.049 |
| L25 | 10.001 | 5.660 | 1.50 | 6.560 | 5.826 | 0.656 | 0.609 | 582.100 | 1297.049 | 1291.772 |
| L26 | 10.002 | 5.660 | 1.50 | 6.560 | 5.847 | 0.656 | 0.609 | 424.300 | 1291.772 | 1287.925 |
| L27 | 10.002 | 5.660 | 1.50 | 6.560 | 5.461 | 0.656 | 0.692 | 759.400 | 1287.925 | 1281.040 |
| L39 | 21.543 | 6.857 | 2.00 | 10.950 | 6.654 | 0.508 | 0.519 | 647.500 | 1281.040 | 1275.168 |
| L40 | 21.543 | 6.857 | 2.00 | 10.950 | 6.654 | 0.508 | 0.519 | 798.700 | 1275.168 | 1267.925 |
| L41 | 21.543 | 6.857 | 2.00 | 10.950 | 6.650 | 0.508 | 0.519 | 667.800 | 1267.925 | 1261.869 |
| L42 | 21.545 | 6.858 | 2.00 | 10.950 | 6.741 | 0.508 | 0.519 | 560.100 | 1261.869 | 1256.789 |
| L43 | 21.543 | 6.857 | 2.00 | 10.950 | 4.841 | 0.508 | 0.948 | 769.600 | 1256.789 | 1249.810 |
| L108 | 25.133 | 5.120 | 2.50 | 22.180 | 5.570 | 0.883 | 0.758 | 680.500 | 1249.810 | 1247.255 |
| L109 | 25.137 | 5.121 | 2.50 | 22.180 | 5.564 | 0.882 | 0.758 | 681.100 | 1247.255 | 1244.697 |
| L110 | 25.139 | 5.121 | 2.50 | 22.180 | 5.561 | 0.882 | 0.758 | 525.500 | 1244.697 | 1242.723 |
| L111 | 25.133 | 5.120 | 2.50 | 22.180 | 5.479 | 0.883 | 0.786 | 525.500 | 1242.723 | 1240.750 |
| L112 | 25.081 | 5.110 | 2.50 | 23.020 | 5.582 | 0.918 | 0.786 | 862.500 | 1240.750 | 1237.525 |
| L118 | 25.082 | 5.110 | 2.50 | 23.020 | 5.567 | 0.918 | 0.788 | 601.700 | 1237.525 | 1235.275 |
| L119 | 25.086 | 5.110 | 2.50 | 23.020 | 6.000 | 0.918 | 0.788 | 547.800 | 1235.275 | 1233.226 |
| L120 | 40.781 | 5.769 | 3.00 | 23.020 | 5.742 | 0.564 | 0.553 | 607.200 | 1233.226 | 1230.956 |
| L121 | 40.798 | 5.772 | 3.00 | 23.020 | 5.741 | 0.564 | 0.553 | 265.400 | 1230.956 | 1229.963 |
| L122 | 40.794 | 5.771 | 3.00 | 23.020 | 5.616 | 0.564 | 0.575 | 259.300 | 1229.963 | 1228.993 |
| L135 | 40.786 | 5.770 | 3.00 | 24.440 | 5.768 | 0.599 | 0.583 | 92.800 | 1228.993 | 1228.646 |
| L140 | 40.776 | 5.769 | 3.00 | 24.980 | 5.776 | 0.613 | 0.595 | 221.000 | 1228.646 | 1227.820 |
| L141 | 39.381 | 5.571 | 3.00 | 24.980 | 5.695 | 0.634 | 0.595 | 502.000 | 1227.820 | 1226.070 |
| L142 | 39.385 | 5.572 | 3.00 | 24.980 | 5.695 | 0.634 | 0.595 | 931.800 | 1226.070 | 1222.821 |
| L143 | 39.387 | 5.572 | 3.00 | 24.980 | 5.695 | 0.634 | 0.595 | 715.200 | 1222.821 | 1220.327 |

APPENDIX A

XP SWMM RESULTS FOR MODEL RUN NO. 1 (WESTSIDE ONLY)

| | | | | | | | | | | |
|------|--------|-------|------|--------|-------|-------|-------|---------|----------|----------|
| L144 | 39.382 | 5.571 | 3.00 | 24.980 | 5.695 | 0.634 | 0.595 | 855.900 | 1220.327 | 1217.343 |
| L145 | 39.386 | 5.572 | 3.00 | 24.980 | 5.695 | 0.634 | 0.595 | 887.600 | 1217.343 | 1214.248 |
| L146 | 39.379 | 5.571 | 3.00 | 24.980 | 5.696 | 0.634 | 0.595 | 719.500 | 1214.248 | 1211.740 |
| L147 | 39.388 | 5.572 | 3.00 | 24.980 | 5.581 | 0.634 | 0.619 | 564.900 | 1211.740 | 1209.770 |
| L153 | 39.372 | 5.570 | 3.00 | 26.450 | 5.763 | 0.672 | 0.619 | 548.700 | 1209.770 | 1207.858 |
| L154 | 39.366 | 5.569 | 3.00 | 26.450 | 5.760 | 0.672 | 0.619 | 679.200 | 1207.858 | 1205.492 |
| L155 | 39.369 | 5.570 | 3.00 | 26.450 | 5.687 | 0.672 | 0.633 | 230.200 | 1205.492 | 1204.690 |
| L160 | 39.376 | 5.571 | 3.00 | 27.400 | 5.807 | 0.696 | 0.633 | 381.600 | 1204.690 | 1203.360 |
| L161 | 39.380 | 5.571 | 3.00 | 27.400 | 5.807 | 0.696 | 0.633 | 761.900 | 1203.360 | 1200.704 |
| L162 | 39.375 | 5.570 | 3.00 | 27.400 | 5.807 | 0.696 | 0.633 | 712.200 | 1200.704 | 1198.222 |
| L163 | 39.381 | 5.571 | 3.00 | 27.400 | 5.768 | 0.696 | 0.642 | 654.600 | 1198.222 | 1195.940 |
| L168 | 39.366 | 5.569 | 3.00 | 27.930 | 5.829 | 0.709 | 0.642 | 788.300 | 1195.940 | 1193.194 |
| L169 | 39.371 | 5.570 | 3.00 | 27.930 | 5.829 | 0.709 | 0.642 | 874.200 | 1193.194 | 1190.148 |
| L170 | 39.370 | 5.570 | 3.00 | 27.930 | 5.829 | 0.709 | 0.642 | 707.500 | 1190.148 | 1187.683 |
| L171 | 39.361 | 5.568 | 3.00 | 27.930 | 5.813 | 0.710 | 0.645 | 527.200 | 1187.683 | 1185.847 |
| L249 | 39.372 | 5.570 | 3.00 | 27.930 | 5.048 | 0.709 | 0.850 | 487.000 | 1185.847 | 1184.150 |
| L250 | 66.585 | 5.299 | 4.00 | 46.820 | 5.536 | 0.703 | 0.638 | 812.100 | 1184.150 | 1182.405 |
| L251 | 66.603 | 5.300 | 4.00 | 46.820 | 5.536 | 0.703 | 0.638 | 712.600 | 1182.405 | 1180.873 |
| L252 | 66.575 | 5.298 | 4.00 | 46.820 | 5.535 | 0.703 | 0.638 | 696.900 | 1180.873 | 1179.376 |
| L253 | 66.597 | 5.300 | 4.00 | 46.820 | 5.536 | 0.703 | 0.638 | 684.800 | 1179.376 | 1177.904 |
| L254 | 66.597 | 5.300 | 4.00 | 46.820 | 5.534 | 0.703 | 0.638 | 722.500 | 1177.904 | 1176.351 |
| L255 | 66.583 | 5.299 | 4.00 | 46.820 | 5.776 | 0.703 | 0.638 | 954.100 | 1176.351 | 1174.301 |
| L256 | 91.186 | 5.733 | 4.50 | 46.820 | 5.576 | 0.513 | 0.522 | 857.600 | 1174.301 | 1172.457 |
| L257 | 91.142 | 5.731 | 4.50 | 46.820 | 5.576 | 0.514 | 0.522 | 817.000 | 1172.457 | 1170.702 |
| L258 | 91.182 | 5.733 | 4.50 | 46.820 | 5.576 | 0.513 | 0.522 | 840.000 | 1170.702 | 1168.896 |
| L259 | 91.158 | 5.732 | 4.50 | 46.820 | 5.575 | 0.514 | 0.522 | 897.700 | 1168.896 | 1166.967 |
| L260 | 91.154 | 5.731 | 4.50 | 46.820 | 5.576 | 0.514 | 0.522 | 762.800 | 1166.967 | 1165.328 |
| L261 | 91.168 | 5.732 | 4.50 | 46.820 | 5.553 | 0.514 | 0.526 | 871.900 | 1165.328 | 1163.454 |
| L262 | 91.165 | 5.732 | 4.50 | 46.820 | 4.664 | 0.514 | 0.703 | 769.600 | 1163.454 | 1161.800 |
| L263 | 83.092 | 5.225 | 4.50 | 66.840 | 5.595 | 0.804 | 0.703 | 801.500 | 1161.800 | 1160.369 |
| L362 | 83.068 | 5.223 | 4.50 | 66.840 | 5.595 | 0.805 | 0.703 | 744.800 | 1160.369 | 1159.040 |
| L363 | 83.111 | 5.226 | 4.50 | 66.840 | 5.595 | 0.804 | 0.703 | 713.800 | 1159.040 | 1157.765 |
| L364 | 83.068 | 5.223 | 4.50 | 66.840 | 5.594 | 0.805 | 0.703 | 502.700 | 1157.765 | 1156.868 |
| L365 | 83.086 | 5.224 | 4.50 | 66.840 | 5.591 | 0.804 | 0.704 | 498.000 | 1156.868 | 1155.979 |
| L366 | 83.081 | 5.224 | 4.50 | 66.840 | 5.503 | 0.805 | 0.726 | 834.200 | 1155.979 | 1154.490 |
| L367 | 83.123 | 5.226 | 4.50 | 69.660 | 5.633 | 0.838 | 0.726 | 950.900 | 1154.490 | 1152.791 |
| L378 | 83.142 | 5.228 | 4.50 | 69.660 | 5.632 | 0.838 | 0.726 | 925.300 | 1152.791 | 1151.137 |
| L379 | 83.118 | 5.226 | 4.50 | 69.660 | 5.631 | 0.838 | 0.726 | 367.200 | 1151.137 | 1150.481 |
| L380 | 83.102 | 5.225 | 4.50 | 69.660 | 5.632 | 0.838 | 0.726 | 286.700 | 1150.481 | 1149.969 |
| L381 | 83.136 | 5.227 | 4.50 | 69.660 | 5.632 | 0.838 | 0.726 | 609.300 | 1149.969 | 1148.880 |
| L382 | 83.120 | 5.226 | 4.50 | 69.660 | 5.632 | 0.838 | 0.726 | 569.800 | 1148.880 | 1147.862 |
| L383 | 83.123 | 5.226 | 4.50 | 69.660 | 5.631 | 0.838 | 0.726 | 638.600 | 1147.862 | 1146.721 |
| L384 | 83.111 | 5.226 | 4.50 | 69.660 | 5.629 | 0.838 | 0.727 | 344.300 | 1146.721 | 1146.106 |

APPENDIX A

XP SWMM RESULTS FOR MODEL RUN NO. 1 (WESTSIDE ONLY)

| | | | | | | | | | | |
|------|---------|-------|------|---------|-------|-------|-------|---------|----------|----------|
| L385 | 83.153 | 5.228 | 4.50 | 69.660 | 5.593 | 0.838 | 0.737 | 686.800 | 1146.106 | 1144.878 |
| L386 | 83.115 | 5.226 | 4.50 | 69.660 | 5.228 | 0.838 | 0.843 | 726.600 | 1144.878 | 1143.580 |
| L437 | 80.581 | 5.067 | 4.50 | 78.870 | 5.542 | 0.979 | 0.844 | 898.100 | 1143.580 | 1142.072 |
| L438 | 80.547 | 5.064 | 4.50 | 78.870 | 5.539 | 0.979 | 0.844 | 847.000 | 1142.072 | 1140.651 |
| L439 | 80.575 | 5.066 | 4.50 | 78.870 | 5.537 | 0.979 | 0.843 | 723.700 | 1140.651 | 1139.436 |
| L440 | 80.579 | 5.067 | 4.50 | 78.870 | 5.538 | 0.979 | 0.843 | 524.700 | 1139.436 | 1138.555 |
| L441 | 80.579 | 5.067 | 4.50 | 78.870 | 5.540 | 0.979 | 0.844 | 793.900 | 1138.555 | 1137.222 |
| L442 | 80.566 | 5.066 | 4.50 | 78.870 | 5.538 | 0.979 | 0.844 | 762.000 | 1137.222 | 1135.943 |
| L443 | 80.561 | 5.065 | 4.50 | 78.870 | 5.536 | 0.979 | 0.844 | 716.200 | 1135.943 | 1134.741 |
| L444 | 80.585 | 5.067 | 4.50 | 78.870 | 5.535 | 0.979 | 0.843 | 607.400 | 1134.741 | 1133.721 |
| L445 | 80.572 | 5.066 | 4.50 | 78.870 | 5.535 | 0.979 | 0.844 | 552.200 | 1133.721 | 1132.794 |
| L446 | 80.542 | 5.064 | 4.50 | 78.870 | 5.539 | 0.979 | 0.844 | 646.200 | 1132.794 | 1131.710 |
| L447 | 80.589 | 5.067 | 4.50 | 78.870 | 5.538 | 0.979 | 0.844 | 978.900 | 1131.710 | 1130.066 |
| L448 | 80.564 | 5.066 | 4.50 | 78.870 | 5.533 | 0.979 | 0.844 | 567.200 | 1130.066 | 1129.114 |
| L449 | 80.559 | 5.065 | 4.50 | 78.870 | 5.536 | 0.979 | 0.844 | 520.200 | 1129.114 | 1128.241 |
| L450 | 80.562 | 5.065 | 4.50 | 78.870 | 5.527 | 0.979 | 0.847 | 930.100 | 1128.241 | 1126.680 |
| L480 | 80.581 | 5.067 | 4.50 | 78.870 | 5.445 | 0.979 | 0.867 | 857.600 | 1126.680 | 1125.240 |
| L481 | 106.081 | 4.465 | 5.50 | 86.320 | 4.791 | 0.814 | 0.709 | 813.700 | 1125.240 | 1124.428 |
| L482 | 106.143 | 4.468 | 5.50 | 86.320 | 4.792 | 0.813 | 0.709 | 757.700 | 1124.428 | 1123.671 |
| L483 | 106.105 | 4.466 | 5.50 | 86.320 | 4.790 | 0.814 | 0.710 | 791.300 | 1123.671 | 1122.881 |
| L484 | 106.021 | 4.462 | 5.50 | 86.320 | 4.790 | 0.814 | 0.710 | 653.100 | 1122.881 | 1122.230 |
| L485 | 106.127 | 4.467 | 5.50 | 86.320 | 4.791 | 0.813 | 0.709 | 737.900 | 1122.230 | 1121.493 |
| L486 | 106.099 | 4.466 | 5.50 | 86.320 | 4.791 | 0.814 | 0.709 | 800.400 | 1121.493 | 1120.694 |
| L487 | 106.070 | 4.465 | 5.50 | 86.320 | 4.790 | 0.814 | 0.709 | 694.600 | 1120.694 | 1120.001 |
| L488 | 106.110 | 4.466 | 5.50 | 86.320 | 4.790 | 0.813 | 0.710 | 773.200 | 1120.001 | 1119.229 |
| L489 | 106.097 | 4.466 | 5.50 | 86.320 | 4.781 | 0.814 | 0.712 | 838.500 | 1119.229 | 1118.392 |
| L490 | 106.135 | 4.467 | 5.50 | 86.320 | 4.718 | 0.813 | 0.729 | 830.900 | 1118.392 | 1117.562 |
| L491 | 106.113 | 4.466 | 5.50 | 86.320 | 4.442 | 0.813 | 0.805 | 735.100 | 1117.562 | 1116.828 |
| L524 | 106.068 | 4.464 | 5.50 | 101.210 | 5.093 | 0.954 | 0.805 | 809.900 | 1116.828 | 1116.020 |
| L525 | 129.561 | 4.582 | 6.00 | 101.210 | 4.886 | 0.781 | 0.687 | 973.400 | 1116.020 | 1115.109 |
| L526 | 129.573 | 4.583 | 6.00 | 101.210 | 4.885 | 0.781 | 0.688 | 566.200 | 1115.109 | 1114.579 |
| L527 | 129.597 | 4.584 | 6.00 | 101.210 | 4.880 | 0.781 | 0.689 | 602.300 | 1114.579 | 1114.015 |
| L528 | 129.566 | 4.582 | 6.00 | 101.210 | 4.857 | 0.781 | 0.694 | 632.500 | 1114.015 | 1113.423 |
| L529 | 129.557 | 4.582 | 6.00 | 101.210 | 4.751 | 0.781 | 0.719 | 676.400 | 1113.423 | 1112.790 |
| L535 | 129.662 | 4.586 | 6.00 | 107.340 | 4.934 | 0.828 | 0.719 | 810.800 | 1112.790 | 1112.030 |
| L536 | 129.658 | 4.586 | 6.00 | 107.340 | 4.943 | 0.828 | 0.719 | 915.400 | 1112.030 | 1111.172 |
| L537 | 129.616 | 4.584 | 6.00 | 107.340 | 5.005 | 0.828 | 0.716 | 843.400 | 1111.172 | 1110.382 |
| L538 | 129.667 | 4.586 | 6.00 | 107.340 | 6.156 | 0.828 | 0.701 | 834.200 | 1110.382 | 1109.600 |

APPENDIX B

Model Run No. 1 Estimated Cost Data

APPENDIX B
DETAILED COST ESTIMATE FOR MODEL RUN NO. 1 (WESTSIDE ONLY)

| CAROLLO e n g i n e e r s | | DETAILED COST ESTIMATE | | | | | | |
|--|--|------------------------|-------|----------|----------|-------------|----------------|--------------------|
| PROJECT : STEVENS CREEK BASIN TRUNK SEWER | | CLASS: | | | | | | |
| JOB # : 6903A.10 | | LOCATION FACTOR: 0.85 | | | | | | |
| LOCATION : LINCOLN, NEBRASKA | | DATE : | | | | | | |
| ELEMENT : 05 - West Main Sewer - E-5E:E-5F | | BY : MJS | | | | | | |
| | | REVIEWED BY: | | | | | | |
| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 0 | LS | | \$12,000 | \$0.00 | | |
| | </= 36" diameter | 6 | LS | | \$3,500 | \$21,000.00 | | |
| | TUNNELING | | | | | | | |
| | for 36-INCH PIPE | 150 | LF | | \$540 | \$81,000.00 | | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$102,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | \$75,000 | \$75,000.00 | | |
| | | | | | | | | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 36-INCH | 4,850 | LF | \$86.00 | \$159.10 | \$245 | \$1,188,735.00 | |
| | Permanent Easement | 194,000 | sq ft | \$0.50 | | \$0.50 | \$97,000.00 | |
| | Construction Easement | 776,000 | sq ft | \$0.05 | | \$0.05 | \$38,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$1,324,535 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$1,501,535 |
| | CONTINGENCY | | | | | 25.00% | \$375,384 | |
| | SUBTOTAL | | | | | | | \$1,876,919 |
| | GENERAL CONDITIONS | | | | | 10.00% | \$187,692 | |
| | SUBTOTAL | | | | | | | \$2,064,611 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$2,064,611 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$412,922 | |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$2,477,533 |

APPENDIX C

Model Run No. 2 Output

APPENDIX C

XP SWMM RESULTS FOR MODEL RUN NO. 2 (WESTSIDE + SUBBASIN E-6)

| Link Name | Design Full Flow (ft^3/s) | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design F | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|---------------------------|------------------------|---------------|-------------------|---------------------|-------------------|-------|-------------|----------------|----------------|
| L1 | 6.152 | 5.013 | 1.25 | 3.851 | 5.168 | 0.626 | 0.593 | 1159.400 | 1395.000 | 1384.486 |
| L2 | 6.153 | 5.014 | 1.25 | 3.850 | 5.124 | 0.626 | 0.590 | 773.700 | 1384.490 | 1377.470 |
| L3 | 6.152 | 5.013 | 1.25 | 3.850 | 5.105 | 0.626 | 0.593 | 610.100 | 1377.470 | 1371.937 |
| L4 | 6.153 | 5.014 | 1.25 | 3.850 | 5.118 | 0.626 | 0.590 | 751.300 | 1371.940 | 1365.124 |
| L5 | 6.152 | 5.013 | 1.25 | 3.850 | 5.110 | 0.626 | 0.590 | 751.400 | 1365.124 | 1358.310 |
| L6 | 6.152 | 5.013 | 1.25 | 3.850 | 5.108 | 0.626 | 0.590 | 462.000 | 1358.310 | 1354.120 |
| L7 | 6.151 | 5.012 | 1.25 | 3.850 | 5.108 | 0.626 | 0.590 | 641.300 | 1354.120 | 1348.306 |
| L8 | 6.150 | 5.012 | 1.25 | 3.850 | 5.109 | 0.626 | 0.590 | 588.300 | 1348.306 | 1342.973 |
| L9 | 6.150 | 5.012 | 1.25 | 3.850 | 5.108 | 0.626 | 0.590 | 744.600 | 1342.973 | 1336.223 |
| L10 | 6.150 | 5.012 | 1.25 | 3.850 | 5.108 | 0.626 | 0.590 | 443.800 | 1336.223 | 1332.200 |
| L11 | 6.153 | 5.014 | 1.25 | 3.850 | 5.110 | 0.626 | 0.590 | 782.000 | 1332.200 | 1325.106 |
| L12 | 6.152 | 5.013 | 1.25 | 3.850 | 5.129 | 0.626 | 0.590 | 690.000 | 1325.106 | 1318.847 |
| L13 | 6.154 | 5.015 | 1.25 | 3.850 | 4.578 | 0.626 | 0.730 | 802.200 | 1318.850 | 1311.570 |
| L22 | 10.001 | 5.659 | 1.50 | 6.552 | 5.825 | 0.655 | 0.608 | 474.400 | 1311.570 | 1307.270 |
| L23 | 10.003 | 5.660 | 1.50 | 6.552 | 5.826 | 0.655 | 0.608 | 573.900 | 1307.270 | 1302.066 |
| L24 | 10.003 | 5.660 | 1.50 | 6.552 | 5.822 | 0.655 | 0.609 | 553.300 | 1302.066 | 1297.049 |
| L25 | 10.002 | 5.660 | 1.50 | 6.552 | 5.825 | 0.655 | 0.608 | 582.100 | 1297.050 | 1291.772 |
| L26 | 10.002 | 5.660 | 1.50 | 6.552 | 5.844 | 0.655 | 0.608 | 424.300 | 1291.772 | 1287.925 |
| L27 | 10.002 | 5.660 | 1.50 | 6.552 | 5.458 | 0.655 | 0.691 | 759.400 | 1287.925 | 1281.040 |
| L39 | 21.543 | 6.857 | 2.00 | 10.942 | 6.652 | 0.508 | 0.518 | 647.500 | 1281.040 | 1275.168 |
| L40 | 21.543 | 6.857 | 2.00 | 10.942 | 6.652 | 0.508 | 0.518 | 798.700 | 1275.168 | 1267.925 |
| L41 | 21.543 | 6.857 | 2.00 | 10.942 | 6.649 | 0.508 | 0.519 | 667.800 | 1267.925 | 1261.869 |
| L42 | 21.545 | 6.858 | 2.00 | 10.942 | 6.736 | 0.508 | 0.519 | 560.100 | 1261.869 | 1256.789 |
| L43 | 21.544 | 6.858 | 2.00 | 10.942 | 4.839 | 0.508 | 0.947 | 769.600 | 1256.790 | 1249.810 |
| L108 | 25.133 | 5.120 | 2.50 | 22.172 | 5.557 | 0.882 | 0.758 | 680.500 | 1249.810 | 1247.255 |
| L109 | 25.137 | 5.121 | 2.50 | 22.172 | 5.557 | 0.882 | 0.758 | 681.100 | 1247.255 | 1244.697 |
| L110 | 25.139 | 5.121 | 2.50 | 22.172 | 5.556 | 0.882 | 0.758 | 525.500 | 1244.697 | 1242.723 |
| L111 | 25.133 | 5.120 | 2.50 | 22.172 | 5.457 | 0.882 | 0.789 | 525.500 | 1242.723 | 1240.750 |
| L112 | 25.140 | 5.121 | 2.50 | 23.167 | 5.583 | 0.922 | 0.789 | 862.500 | 1240.750 | 1237.510 |
| L118 | 25.143 | 5.122 | 2.50 | 23.167 | 5.581 | 0.921 | 0.789 | 601.700 | 1237.510 | 1235.249 |
| L119 | 25.147 | 5.123 | 2.50 | 23.167 | 5.580 | 0.921 | 0.790 | 547.800 | 1235.249 | 1233.190 |
| L120 | 25.134 | 5.120 | 2.50 | 23.167 | 5.566 | 0.922 | 0.793 | 607.200 | 1233.190 | 1230.910 |
| L121 | 24.899 | 5.072 | 2.50 | 23.167 | 5.996 | 0.930 | 0.793 | 265.400 | 1230.910 | 1229.932 |
| L122 | 40.499 | 5.729 | 3.00 | 23.167 | 5.719 | 0.572 | 0.558 | 259.300 | 1229.932 | 1228.976 |
| L135 | 40.491 | 5.728 | 3.00 | 23.167 | 5.710 | 0.572 | 0.559 | 92.800 | 1228.976 | 1228.634 |
| L140 | 40.479 | 5.727 | 3.00 | 23.167 | 5.466 | 0.572 | 0.603 | 221.000 | 1228.634 | 1227.820 |
| L141 | 39.358 | 5.568 | 3.00 | 25.447 | 5.717 | 0.647 | 0.603 | 502.000 | 1227.820 | 1226.072 |
| L142 | 39.385 | 5.572 | 3.00 | 25.447 | 5.718 | 0.646 | 0.603 | 931.800 | 1226.072 | 1222.823 |
| L143 | 39.379 | 5.571 | 3.00 | 25.447 | 5.719 | 0.646 | 0.603 | 715.200 | 1222.823 | 1220.330 |
| L144 | 39.396 | 5.573 | 3.00 | 25.447 | 5.719 | 0.646 | 0.603 | 855.900 | 1220.330 | 1217.344 |

APPENDIX C

XP SWMM RESULTS FOR MODEL RUN NO. 2 (WESTSIDE + SUBBASIN E-6)

| | | | | | | | | | | |
|------|--------|-------|------|--------|-------|-------|-------|---------|----------|----------|
| L145 | 39.379 | 5.571 | 3.00 | 25.447 | 5.718 | 0.646 | 0.603 | 887.600 | 1217.344 | 1214.250 |
| L146 | 39.395 | 5.573 | 3.00 | 25.447 | 5.720 | 0.646 | 0.602 | 719.500 | 1214.250 | 1211.740 |
| L147 | 39.388 | 5.572 | 3.00 | 25.447 | 5.642 | 0.646 | 0.618 | 564.900 | 1211.740 | 1209.770 |
| L153 | 39.372 | 5.570 | 3.00 | 26.434 | 5.762 | 0.671 | 0.618 | 548.700 | 1209.770 | 1207.858 |
| L154 | 39.366 | 5.569 | 3.00 | 26.434 | 5.759 | 0.671 | 0.619 | 679.200 | 1207.858 | 1205.492 |
| L155 | 39.369 | 5.570 | 3.00 | 26.434 | 5.687 | 0.671 | 0.633 | 230.200 | 1205.492 | 1204.690 |
| L160 | 39.376 | 5.571 | 3.00 | 27.384 | 5.806 | 0.695 | 0.633 | 381.600 | 1204.690 | 1203.360 |
| L161 | 39.380 | 5.571 | 3.00 | 27.384 | 5.806 | 0.695 | 0.633 | 761.900 | 1203.360 | 1200.704 |
| L162 | 39.375 | 5.570 | 3.00 | 27.384 | 5.807 | 0.695 | 0.633 | 712.200 | 1200.704 | 1198.222 |
| L163 | 39.381 | 5.571 | 3.00 | 27.384 | 5.763 | 0.695 | 0.642 | 654.600 | 1198.222 | 1195.940 |
| L168 | 39.323 | 5.563 | 3.00 | 27.934 | 5.827 | 0.710 | 0.642 | 788.300 | 1195.940 | 1193.200 |
| L169 | 39.397 | 5.573 | 3.00 | 27.934 | 5.831 | 0.709 | 0.642 | 874.200 | 1193.200 | 1190.150 |
| L170 | 39.370 | 5.570 | 3.00 | 27.934 | 5.821 | 0.710 | 0.644 | 707.500 | 1190.150 | 1187.685 |
| L171 | 39.382 | 5.571 | 3.00 | 27.934 | 6.364 | 0.709 | 0.644 | 527.200 | 1187.685 | 1185.847 |
| L249 | 84.793 | 6.748 | 4.00 | 27.934 | 4.709 | 0.329 | 0.568 | 487.000 | 1185.847 | 1184.150 |
| L250 | 79.235 | 6.305 | 4.00 | 46.804 | 6.286 | 0.591 | 0.605 | 812.100 | 1184.150 | 1181.679 |
| L251 | 72.133 | 5.740 | 4.00 | 46.804 | 6.422 | 0.649 | 0.605 | 712.600 | 1181.679 | 1179.882 |
| L252 | 85.239 | 6.783 | 4.00 | 46.804 | 5.929 | 0.549 | 0.676 | 696.900 | 1178.882 | 1176.428 |
| L253 | 61.321 | 4.880 | 4.00 | 46.804 | 5.138 | 0.763 | 0.687 | 684.800 | 1176.428 | 1175.180 |
| L254 | 59.962 | 4.772 | 4.00 | 46.804 | 5.114 | 0.781 | 0.687 | 722.500 | 1175.180 | 1173.921 |
| L255 | 60.776 | 4.836 | 4.00 | 46.804 | 5.146 | 0.770 | 0.680 | 954.100 | 1173.921 | 1172.213 |
| L256 | 60.791 | 4.838 | 4.00 | 46.804 | 5.146 | 0.770 | 0.680 | 857.600 | 1172.213 | 1170.677 |
| L257 | 60.764 | 4.835 | 4.00 | 46.804 | 5.145 | 0.770 | 0.680 | 817.000 | 1170.677 | 1169.215 |
| L258 | 60.781 | 4.837 | 4.00 | 46.804 | 5.146 | 0.770 | 0.680 | 840.000 | 1169.215 | 1167.711 |
| L259 | 60.775 | 4.836 | 4.00 | 46.804 | 5.145 | 0.770 | 0.680 | 897.700 | 1167.711 | 1166.104 |
| L260 | 60.764 | 4.835 | 4.00 | 46.804 | 5.145 | 0.770 | 0.680 | 762.800 | 1166.104 | 1164.739 |
| L261 | 60.779 | 4.837 | 4.00 | 46.804 | 5.124 | 0.770 | 0.685 | 871.900 | 1164.739 | 1163.178 |
| L262 | 60.782 | 4.837 | 4.00 | 46.804 | 4.761 | 0.770 | 0.789 | 769.600 | 1163.178 | 1161.800 |
| L263 | 83.063 | 5.223 | 4.50 | 66.574 | 5.591 | 0.801 | 0.701 | 801.500 | 1161.800 | 1160.370 |
| L362 | 83.099 | 5.225 | 4.50 | 66.574 | 5.593 | 0.801 | 0.701 | 744.800 | 1160.370 | 1159.040 |
| L363 | 83.111 | 5.226 | 4.50 | 66.574 | 5.592 | 0.801 | 0.701 | 713.800 | 1159.040 | 1157.765 |
| L364 | 83.068 | 5.223 | 4.50 | 66.574 | 5.590 | 0.801 | 0.701 | 502.700 | 1157.765 | 1156.868 |
| L365 | 83.086 | 5.224 | 4.50 | 66.574 | 5.586 | 0.801 | 0.702 | 498.000 | 1156.868 | 1155.979 |
| L366 | 83.109 | 5.226 | 4.50 | 66.574 | 5.492 | 0.801 | 0.726 | 834.200 | 1155.980 | 1154.490 |
| L367 | 83.123 | 5.226 | 4.50 | 69.644 | 5.632 | 0.838 | 0.726 | 950.900 | 1154.490 | 1152.791 |
| L378 | 83.142 | 5.228 | 4.50 | 69.644 | 5.632 | 0.838 | 0.726 | 925.300 | 1152.791 | 1151.137 |
| L379 | 83.118 | 5.226 | 4.50 | 69.644 | 5.631 | 0.838 | 0.726 | 367.200 | 1151.137 | 1150.481 |
| L380 | 83.102 | 5.225 | 4.50 | 69.644 | 5.631 | 0.838 | 0.726 | 286.700 | 1150.481 | 1149.969 |
| L381 | 83.136 | 5.227 | 4.50 | 69.644 | 5.632 | 0.838 | 0.726 | 609.300 | 1149.969 | 1148.880 |
| L382 | 83.120 | 5.226 | 4.50 | 69.644 | 5.631 | 0.838 | 0.726 | 569.800 | 1148.880 | 1147.862 |
| L383 | 83.123 | 5.226 | 4.50 | 69.644 | 5.631 | 0.838 | 0.726 | 638.600 | 1147.862 | 1146.721 |
| L384 | 83.111 | 5.226 | 4.50 | 69.644 | 5.629 | 0.838 | 0.727 | 344.300 | 1146.721 | 1146.106 |

APPENDIX C

XP SWMM RESULTS FOR MODEL RUN NO. 2 (WESTSIDE + SUBBASIN E-6)

| | | | | | | | | | | |
|------|---------|-------|------|---------|-------|-------|-------|---------|----------|----------|
| L385 | 83.153 | 5.228 | 4.50 | 69.644 | 5.594 | 0.838 | 0.736 | 686.800 | 1146.106 | 1144.878 |
| L386 | 83.115 | 5.226 | 4.50 | 69.644 | 5.237 | 0.838 | 0.838 | 726.600 | 1144.878 | 1143.580 |
| L437 | 80.927 | 5.088 | 4.50 | 78.854 | 5.555 | 0.974 | 0.838 | 898.100 | 1143.580 | 1142.059 |
| L438 | 80.914 | 5.088 | 4.50 | 78.854 | 5.550 | 0.975 | 0.839 | 847.000 | 1142.059 | 1140.625 |
| L439 | 80.906 | 5.087 | 4.50 | 78.854 | 5.549 | 0.975 | 0.839 | 723.700 | 1140.625 | 1139.400 |
| L440 | 80.899 | 5.087 | 4.50 | 78.854 | 5.549 | 0.975 | 0.839 | 524.700 | 1139.400 | 1138.512 |
| L441 | 80.911 | 5.087 | 4.50 | 78.854 | 5.551 | 0.975 | 0.838 | 793.900 | 1138.512 | 1137.168 |
| L442 | 80.943 | 5.089 | 4.50 | 78.854 | 5.550 | 0.974 | 0.839 | 762.000 | 1137.168 | 1135.877 |
| L443 | 80.896 | 5.086 | 4.50 | 78.854 | 5.549 | 0.975 | 0.839 | 716.200 | 1135.877 | 1134.665 |
| L444 | 80.940 | 5.089 | 4.50 | 78.854 | 5.550 | 0.974 | 0.838 | 607.400 | 1134.665 | 1133.636 |
| L445 | 80.919 | 5.088 | 4.50 | 78.854 | 5.549 | 0.974 | 0.839 | 552.200 | 1133.636 | 1132.701 |
| L446 | 80.913 | 5.087 | 4.50 | 78.854 | 5.546 | 0.975 | 0.841 | 646.200 | 1132.701 | 1131.607 |
| L447 | 80.907 | 5.087 | 4.50 | 78.854 | 5.507 | 0.975 | 0.858 | 978.900 | 1131.607 | 1129.950 |
| L448 | 79.585 | 5.004 | 4.50 | 78.854 | 5.459 | 0.991 | 0.859 | 567.200 | 1129.950 | 1129.021 |
| L449 | 79.537 | 5.001 | 4.50 | 78.854 | 5.462 | 0.991 | 0.859 | 520.200 | 1129.021 | 1128.170 |
| L450 | 79.627 | 5.007 | 4.50 | 78.854 | 5.456 | 0.990 | 0.860 | 930.100 | 1128.170 | 1126.645 |
| L480 | 79.595 | 5.005 | 4.50 | 78.854 | 5.408 | 0.991 | 0.867 | 857.600 | 1126.645 | 1125.240 |
| L481 | 106.081 | 4.465 | 5.50 | 86.304 | 4.791 | 0.814 | 0.709 | 813.700 | 1125.240 | 1124.428 |
| L482 | 106.143 | 4.468 | 5.50 | 86.304 | 4.792 | 0.813 | 0.709 | 757.700 | 1124.428 | 1123.671 |
| L483 | 106.105 | 4.466 | 5.50 | 86.304 | 4.790 | 0.813 | 0.710 | 791.300 | 1123.671 | 1122.881 |
| L484 | 106.021 | 4.462 | 5.50 | 86.304 | 4.790 | 0.814 | 0.710 | 653.100 | 1122.881 | 1122.230 |
| L485 | 106.127 | 4.467 | 5.50 | 86.304 | 4.791 | 0.813 | 0.709 | 737.900 | 1122.230 | 1121.493 |
| L486 | 106.099 | 4.466 | 5.50 | 86.304 | 4.790 | 0.813 | 0.709 | 800.400 | 1121.493 | 1120.694 |
| L487 | 106.070 | 4.465 | 5.50 | 86.304 | 4.791 | 0.814 | 0.709 | 694.600 | 1120.694 | 1120.001 |
| L488 | 106.110 | 4.466 | 5.50 | 86.304 | 4.791 | 0.813 | 0.709 | 773.200 | 1120.001 | 1119.229 |
| L489 | 106.097 | 4.466 | 5.50 | 86.304 | 4.789 | 0.813 | 0.710 | 838.500 | 1119.229 | 1118.392 |
| L490 | 106.135 | 4.467 | 5.50 | 86.304 | 4.776 | 0.813 | 0.713 | 830.900 | 1118.392 | 1117.562 |
| L491 | 106.113 | 4.466 | 5.50 | 86.304 | 4.694 | 0.813 | 0.735 | 735.100 | 1117.562 | 1116.828 |
| L524 | 106.068 | 4.464 | 5.50 | 86.304 | 4.361 | 0.814 | 0.832 | 809.900 | 1116.828 | 1116.020 |
| L525 | 129.490 | 4.580 | 6.00 | 115.074 | 4.976 | 0.889 | 0.763 | 973.400 | 1116.020 | 1115.110 |
| L526 | 129.573 | 4.583 | 6.00 | 115.074 | 4.977 | 0.888 | 0.762 | 566.200 | 1115.110 | 1114.580 |
| L527 | 129.597 | 4.584 | 6.00 | 115.074 | 4.975 | 0.888 | 0.763 | 602.300 | 1114.580 | 1114.016 |
| L528 | 129.566 | 4.582 | 6.00 | 115.074 | 4.970 | 0.888 | 0.764 | 632.500 | 1114.016 | 1113.424 |
| L529 | 129.660 | 4.586 | 6.00 | 115.074 | 4.945 | 0.888 | 0.771 | 676.400 | 1113.424 | 1112.790 |
| L535 | 129.747 | 4.589 | 6.00 | 116.664 | 4.990 | 0.899 | 0.771 | 810.800 | 1112.790 | 1112.029 |
| L536 | 129.734 | 4.588 | 6.00 | 116.664 | 5.000 | 0.899 | 0.771 | 915.400 | 1112.029 | 1111.170 |
| L537 | 129.534 | 4.581 | 6.00 | 116.664 | 5.072 | 0.901 | 0.768 | 843.400 | 1111.170 | 1110.381 |
| L538 | 129.584 | 4.583 | 6.00 | 116.664 | 6.275 | 0.900 | 0.747 | 834.200 | 1110.381 | 1109.600 |

APPENDIX D

Model Run No. 2 Estimated Cost Data

APPENDIX D
DETAILED COST ESTIMATE FOR MODEL RUN NO.2 (WESTSIDE + SUBBASIN E-6)

|  CAROLLO e n g i n e e r s | | PROJECT SUMMARY |
|---|--|----------------------------|
| | | ESTIMATE CLASS: <u>3</u> |
| PROJECT : | <u>STEVEN'S CREEK GRAVITY SEWER</u> | |
| JOB # : | <u>6903A.10</u> | DATE : <u>6/8/2004</u> |
| LOCATION : | <u>LINCOLN, NEBRASKA</u> | BY : <u>MJS</u> |
| ELEMENT/ PHASE # | ELEMENT | COST |
| 1/ PH IX | JCT BOX E-5A to JCT BOX E-5B; 3,400 LF OF 18" PIPE | \$1,038,345 |
| 2/ PH IX | JCT BOX E-5B to JCT BOX E-5C; 3,450 LF OF 24" PIPE | \$1,182,316 |
| 3/ PH VIII | JCT BOX E-5C to JCT BOX E-5D; 2,700 LF OF 30" PIPE | \$1,269,675 |
| 4/ PH VIII | JCT BOX E-5D to JCT BOX E-5E; 3,700 LF OF 30"-36" PIPE | \$1,628,241 |
| 5/ PH VIII | JCT BOX E-5E to JCT BOX E-5F; 4,850 LF OF 36" PIPE | \$2,477,533 |
| 6/ PH VIII | JCT BOX E-5F to JCT BOX E-5G; 1,800 LF OF 36" PIPE | \$946,407 |
| 7/ PH VII | JCT BOX E-5G to JCT BOX E-5H; 2,100 LF OF 36" PIPE | \$1,221,017 |
| 8/ PH VII | JCT BOX E-5H to JCT BOX E-4; 6,200 LF OF 36"-48" PIPE | \$3,577,967 |
| 9/ PH VI | JCT BOX E-4 to JCT BOX E-3A; 7,400 LF OF 48" PIPE | \$4,891,474 |
| 10/ PH V | JCT BOX E-3A to JCT BOX E-3B; 4,000 LF OF 54" PIPE | \$3,637,173 |
| 11/PH V | JCT BOX E-3B to JCT BOX E-2; 6,200 LF OF 54" PIPE | \$5,300,318 |
| 12/ PH IV | SUBBASIN E-2 TRIB SEWER; 8,300 LF OF 18"-24" PIPE | \$2,905,636 |
| 13/ PH III | JCT BOX E-2 to JCT BOX E-1; 11,000 LF OF 54" PIPE | \$9,181,343 |
| 14/ PH II | JCT BOX E-1 to JCT BOX E-11/E-6; 9,300 LF OF 66" PIPE | \$10,566,146 |
| 15/ PH I | JCT BOX E-11/E-6 to JCT BOX E-12; 3,600 LF OF 72" PIPE | \$5,286,006 |
| 16/ PH I | JCT BOX E-12 TO NE WWTP; 4,100 LF OF 72" PIPE | \$4,884,149 |
| | TOTAL ESTIMATED PROJECT COST | <u>\$59,993,744</u> |

APPENDIX E

Model Run No. 3 Output

APPENDIX E

XP SWMM RESULTS FOR MODEL RUN NO. 3 (WESTSIDE + SUBBASIN E-6 EASTSIDE)

Model Run 3 - No Surcharging

| Link Name | Design Full Flow (ft^3/s) | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design Flow | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|---------------------------|------------------------|---------------|-------------------|---------------------|----------------------|-------|-------------|----------------|----------------|
| L1 | 6.150 | 5.012 | 1.25 | 3.870 | 6.784 | 0.629 | 0.594 | 1159.400 | 1395.000 | 1384.490 |
| L2 | 6.153 | 5.014 | 1.25 | 3.860 | 5.629 | 0.627 | 0.591 | 773.700 | 1384.490 | 1377.470 |
| L3 | 6.150 | 5.012 | 1.25 | 3.860 | 5.441 | 0.628 | 0.591 | 610.100 | 1377.470 | 1371.940 |
| L4 | 6.155 | 5.015 | 1.25 | 3.860 | 5.470 | 0.627 | 0.591 | 751.300 | 1371.940 | 1365.120 |
| L5 | 6.150 | 5.011 | 1.25 | 3.860 | 5.228 | 0.628 | 0.591 | 751.400 | 1365.120 | 1358.310 |
| L6 | 6.152 | 5.013 | 1.25 | 3.860 | 5.171 | 0.627 | 0.591 | 462.000 | 1358.310 | 1354.120 |
| L7 | 6.149 | 5.010 | 1.25 | 3.860 | 5.223 | 0.628 | 0.591 | 641.300 | 1354.120 | 1348.310 |
| L8 | 6.154 | 5.015 | 1.25 | 3.860 | 5.279 | 0.627 | 0.591 | 588.300 | 1348.310 | 1342.970 |
| L9 | 6.150 | 5.012 | 1.25 | 3.860 | 5.180 | 0.628 | 0.591 | 744.600 | 1342.970 | 1336.220 |
| L10 | 6.156 | 5.016 | 1.25 | 3.860 | 5.180 | 0.627 | 0.591 | 443.800 | 1336.220 | 1332.190 |
| L11 | 6.151 | 5.012 | 1.25 | 3.860 | 5.340 | 0.628 | 0.592 | 782.000 | 1332.190 | 1325.100 |
| L12 | 6.148 | 5.010 | 1.25 | 3.860 | 5.604 | 0.628 | 0.592 | 690.000 | 1325.100 | 1318.850 |
| L13 | 6.154 | 5.015 | 1.25 | 3.860 | 4.583 | 0.627 | 0.730 | 802.200 | 1318.850 | 1311.570 |
| L22 | 10.001 | 5.659 | 1.50 | 6.560 | 5.826 | 0.656 | 0.609 | 474.400 | 1311.570 | 1307.270 |
| L23 | 9.999 | 5.658 | 1.50 | 6.560 | 5.828 | 0.656 | 0.609 | 573.900 | 1307.270 | 1302.070 |
| L24 | 10.006 | 5.662 | 1.50 | 6.560 | 5.829 | 0.656 | 0.609 | 553.300 | 1302.070 | 1297.050 |
| L25 | 10.004 | 5.661 | 1.50 | 6.560 | 5.825 | 0.656 | 0.609 | 582.100 | 1297.050 | 1291.770 |
| L26 | 9.993 | 5.655 | 1.50 | 6.560 | 5.846 | 0.656 | 0.609 | 424.300 | 1291.770 | 1287.930 |
| L27 | 10.006 | 5.662 | 1.50 | 6.560 | 5.461 | 0.656 | 0.692 | 759.400 | 1287.930 | 1281.040 |
| L39 | 21.540 | 6.856 | 2.00 | 10.950 | 6.653 | 0.508 | 0.519 | 647.500 | 1281.040 | 1275.170 |
| L40 | 21.539 | 6.856 | 2.00 | 10.950 | 6.654 | 0.508 | 0.519 | 798.700 | 1275.170 | 1267.930 |
| L41 | 21.550 | 6.860 | 2.00 | 10.950 | 6.651 | 0.508 | 0.519 | 667.800 | 1267.930 | 1261.870 |
| L42 | 21.545 | 6.858 | 2.00 | 10.950 | 6.741 | 0.508 | 0.519 | 560.100 | 1261.870 | 1256.790 |
| L43 | 21.544 | 6.858 | 2.00 | 10.950 | 4.840 | 0.508 | 0.948 | 769.600 | 1256.790 | 1249.810 |
| L108 | 25.109 | 5.115 | 2.50 | 22.180 | 5.569 | 0.883 | 0.759 | 680.500 | 1249.810 | 1247.260 |
| L109 | 25.147 | 5.123 | 2.50 | 22.180 | 5.569 | 0.882 | 0.758 | 681.100 | 1247.260 | 1244.700 |
| L110 | 25.177 | 5.129 | 2.50 | 22.180 | 5.563 | 0.881 | 0.759 | 525.500 | 1244.700 | 1242.720 |
| L111 | 25.114 | 5.116 | 2.50 | 22.180 | 5.461 | 0.883 | 0.792 | 525.500 | 1242.720 | 1240.750 |
| L112 | 25.062 | 5.106 | 2.50 | 23.170 | 5.582 | 0.925 | 0.792 | 862.500 | 1240.750 | 1237.530 |
| L118 | 25.082 | 5.110 | 2.50 | 23.170 | 5.571 | 0.924 | 0.793 | 601.700 | 1237.530 | 1235.280 |
| L119 | 25.092 | 5.112 | 2.50 | 23.170 | 6.008 | 0.923 | 0.793 | 547.800 | 1235.280 | 1233.230 |
| L120 | 40.781 | 5.769 | 3.00 | 23.170 | 5.757 | 0.568 | 0.555 | 607.200 | 1233.230 | 1230.960 |
| L121 | 40.942 | 5.792 | 3.00 | 23.170 | 5.760 | 0.566 | 0.555 | 265.400 | 1230.960 | 1229.960 |
| L122 | 40.794 | 5.771 | 3.00 | 23.170 | 5.733 | 0.568 | 0.558 | 259.300 | 1229.960 | 1228.990 |
| L135 | 40.372 | 5.711 | 3.00 | 23.170 | 5.725 | 0.574 | 0.558 | 92.800 | 1228.990 | 1228.650 |
| L140 | 40.875 | 5.783 | 3.00 | 23.170 | 5.488 | 0.567 | 0.603 | 221.000 | 1228.650 | 1227.820 |
| L141 | 39.381 | 5.571 | 3.00 | 25.450 | 5.719 | 0.646 | 0.603 | 502.000 | 1227.820 | 1226.070 |
| L142 | 39.391 | 5.573 | 3.00 | 25.450 | 5.718 | 0.646 | 0.603 | 931.800 | 1226.070 | 1222.820 |
| L143 | 39.355 | 5.568 | 3.00 | 25.450 | 5.719 | 0.647 | 0.603 | 715.200 | 1222.820 | 1220.330 |

APPENDIX E

XP SWMM RESULTS FOR MODEL RUN NO. 3 (WESTSIDE + SUBBASIN E-6 EASTSIDE)

| | | | | | | | | | | |
|------|--------|-------|------|--------|-------|-------|-------|---------|----------|----------|
| L144 | 39.422 | 5.577 | 3.00 | 25.450 | 5.720 | 0.646 | 0.603 | 855.900 | 1220.330 | 1217.340 |
| L145 | 39.354 | 5.567 | 3.00 | 25.450 | 5.717 | 0.647 | 0.603 | 887.600 | 1217.340 | 1214.250 |
| L146 | 39.395 | 5.573 | 3.00 | 25.450 | 5.720 | 0.646 | 0.603 | 719.500 | 1214.250 | 1211.740 |
| L147 | 39.388 | 5.572 | 3.00 | 25.450 | 5.640 | 0.646 | 0.619 | 564.900 | 1211.740 | 1209.770 |
| L153 | 39.352 | 5.567 | 3.00 | 26.440 | 5.763 | 0.672 | 0.619 | 548.700 | 1209.770 | 1207.860 |
| L154 | 39.399 | 5.574 | 3.00 | 26.440 | 5.759 | 0.671 | 0.619 | 679.200 | 1207.860 | 1205.490 |
| L155 | 39.319 | 5.563 | 3.00 | 26.440 | 5.684 | 0.672 | 0.633 | 230.200 | 1205.490 | 1204.690 |
| L160 | 39.376 | 5.571 | 3.00 | 27.390 | 5.808 | 0.696 | 0.633 | 381.600 | 1204.690 | 1203.360 |
| L161 | 39.410 | 5.575 | 3.00 | 27.390 | 5.807 | 0.695 | 0.633 | 761.900 | 1203.360 | 1200.700 |
| L162 | 39.359 | 5.568 | 3.00 | 27.390 | 5.805 | 0.696 | 0.633 | 712.200 | 1200.700 | 1198.220 |
| L163 | 39.364 | 5.569 | 3.00 | 27.390 | 5.766 | 0.696 | 0.642 | 654.600 | 1198.220 | 1195.940 |
| L168 | 39.395 | 5.573 | 3.00 | 27.940 | 5.829 | 0.709 | 0.642 | 788.300 | 1195.940 | 1193.190 |
| L169 | 39.332 | 5.564 | 3.00 | 27.940 | 5.829 | 0.710 | 0.642 | 874.200 | 1193.190 | 1190.150 |
| L170 | 39.409 | 5.575 | 3.00 | 27.940 | 5.828 | 0.709 | 0.643 | 707.500 | 1190.150 | 1187.680 |
| L171 | 39.296 | 5.559 | 3.00 | 27.940 | 5.811 | 0.711 | 0.645 | 527.200 | 1187.680 | 1185.850 |
| L249 | 39.407 | 5.575 | 3.00 | 27.940 | 5.049 | 0.709 | 0.851 | 487.000 | 1185.850 | 1184.150 |
| L250 | 66.490 | 5.291 | 4.00 | 46.810 | 5.537 | 0.704 | 0.638 | 812.100 | 1184.150 | 1182.410 |
| L251 | 66.776 | 5.314 | 4.00 | 46.810 | 5.537 | 0.701 | 0.639 | 712.600 | 1182.410 | 1180.870 |
| L252 | 66.419 | 5.285 | 4.00 | 46.810 | 5.535 | 0.705 | 0.639 | 696.900 | 1180.870 | 1179.380 |
| L253 | 66.778 | 5.314 | 4.00 | 46.810 | 5.540 | 0.701 | 0.638 | 684.800 | 1179.380 | 1177.900 |
| L254 | 66.532 | 5.294 | 4.00 | 46.810 | 5.531 | 0.704 | 0.638 | 722.500 | 1177.900 | 1176.350 |
| L255 | 66.583 | 5.299 | 4.00 | 46.810 | 5.773 | 0.703 | 0.638 | 954.100 | 1176.350 | 1174.300 |
| L256 | 91.087 | 5.727 | 4.50 | 46.810 | 5.576 | 0.514 | 0.522 | 857.600 | 1174.300 | 1172.460 |
| L257 | 91.272 | 5.739 | 4.50 | 46.810 | 5.575 | 0.513 | 0.522 | 817.000 | 1172.460 | 1170.700 |
| L258 | 91.031 | 5.724 | 4.50 | 46.810 | 5.572 | 0.514 | 0.522 | 840.000 | 1170.700 | 1168.900 |
| L259 | 91.181 | 5.733 | 4.50 | 46.810 | 5.576 | 0.513 | 0.522 | 897.700 | 1168.900 | 1166.970 |
| L260 | 91.182 | 5.733 | 4.50 | 46.810 | 5.579 | 0.513 | 0.522 | 762.800 | 1166.970 | 1165.330 |
| L261 | 91.314 | 5.741 | 4.50 | 46.810 | 5.554 | 0.513 | 0.526 | 871.900 | 1165.330 | 1163.450 |
| L262 | 91.055 | 5.725 | 4.50 | 46.810 | 4.670 | 0.514 | 0.701 | 769.600 | 1163.450 | 1161.800 |
| L263 | 83.063 | 5.223 | 4.50 | 66.580 | 5.591 | 0.802 | 0.701 | 801.500 | 1161.800 | 1160.370 |
| L362 | 83.099 | 5.225 | 4.50 | 66.580 | 5.589 | 0.801 | 0.702 | 744.800 | 1160.370 | 1159.040 |
| L363 | 82.948 | 5.215 | 4.50 | 66.580 | 5.591 | 0.803 | 0.702 | 713.800 | 1159.040 | 1157.770 |
| L364 | 83.207 | 5.232 | 4.50 | 66.580 | 5.596 | 0.800 | 0.701 | 502.700 | 1157.770 | 1156.870 |
| L365 | 83.133 | 5.227 | 4.50 | 66.580 | 5.589 | 0.801 | 0.702 | 498.000 | 1156.870 | 1155.980 |
| L366 | 83.109 | 5.226 | 4.50 | 66.580 | 5.493 | 0.801 | 0.726 | 834.200 | 1155.980 | 1154.490 |
| L367 | 83.147 | 5.228 | 4.50 | 69.650 | 5.632 | 0.838 | 0.727 | 950.900 | 1154.490 | 1152.790 |
| L378 | 83.041 | 5.221 | 4.50 | 69.650 | 5.634 | 0.839 | 0.727 | 925.300 | 1152.790 | 1151.140 |
| L379 | 83.371 | 5.242 | 4.50 | 69.650 | 5.634 | 0.835 | 0.727 | 367.200 | 1151.140 | 1150.480 |
| L380 | 82.940 | 5.215 | 4.50 | 69.650 | 5.629 | 0.840 | 0.727 | 286.700 | 1150.480 | 1149.970 |
| L381 | 83.174 | 5.230 | 4.50 | 69.650 | 5.635 | 0.837 | 0.726 | 609.300 | 1149.970 | 1148.880 |
| L382 | 83.201 | 5.231 | 4.50 | 69.650 | 5.632 | 0.837 | 0.727 | 569.800 | 1148.880 | 1147.860 |
| L383 | 83.086 | 5.224 | 4.50 | 69.650 | 5.622 | 0.838 | 0.728 | 638.600 | 1147.860 | 1146.720 |

APPENDIX E

XP SWMM RESULTS FOR MODEL RUN NO. 3 (WESTSIDE + SUBBASIN E-6 EASTSIDE)

| | | | | | | | | | | |
|------|---------|-------|------|---------|-------|-------|-------|---------|----------|----------|
| L384 | 82.773 | 5.204 | 4.50 | 69.650 | 5.622 | 0.841 | 0.728 | 344.300 | 1146.720 | 1146.110 |
| L385 | 83.220 | 5.233 | 4.50 | 69.650 | 5.597 | 0.837 | 0.736 | 686.800 | 1146.110 | 1144.880 |
| L386 | 83.179 | 5.230 | 4.50 | 69.650 | 5.231 | 0.837 | 0.843 | 726.600 | 1144.880 | 1143.580 |
| L437 | 80.634 | 5.070 | 4.50 | 78.860 | 5.542 | 0.978 | 0.844 | 898.100 | 1143.580 | 1142.070 |
| L438 | 80.518 | 5.063 | 4.50 | 78.860 | 5.534 | 0.979 | 0.845 | 847.000 | 1142.070 | 1140.650 |
| L439 | 80.409 | 5.056 | 4.50 | 78.860 | 5.531 | 0.981 | 0.845 | 723.700 | 1140.650 | 1139.440 |
| L440 | 80.534 | 5.064 | 4.50 | 78.860 | 5.543 | 0.979 | 0.843 | 524.700 | 1139.440 | 1138.560 |
| L441 | 80.791 | 5.080 | 4.50 | 78.860 | 5.547 | 0.976 | 0.843 | 793.900 | 1138.560 | 1137.220 |
| L442 | 80.597 | 5.068 | 4.50 | 78.860 | 5.537 | 0.978 | 0.844 | 762.000 | 1137.220 | 1135.940 |
| L443 | 80.494 | 5.061 | 4.50 | 78.860 | 5.535 | 0.980 | 0.844 | 716.200 | 1135.940 | 1134.740 |
| L444 | 80.585 | 5.067 | 4.50 | 78.860 | 5.538 | 0.979 | 0.843 | 607.400 | 1134.740 | 1133.720 |
| L445 | 80.702 | 5.074 | 4.50 | 78.860 | 5.534 | 0.977 | 0.846 | 552.200 | 1133.720 | 1132.790 |
| L446 | 80.393 | 5.055 | 4.50 | 78.860 | 5.532 | 0.981 | 0.846 | 646.200 | 1132.790 | 1131.710 |
| L447 | 80.491 | 5.061 | 4.50 | 78.860 | 5.544 | 0.980 | 0.844 | 978.900 | 1131.710 | 1130.070 |
| L448 | 80.902 | 5.087 | 4.50 | 78.860 | 5.539 | 0.975 | 0.845 | 567.200 | 1130.070 | 1129.110 |
| L449 | 80.420 | 5.057 | 4.50 | 78.860 | 5.531 | 0.981 | 0.845 | 520.200 | 1129.110 | 1128.240 |
| L450 | 80.536 | 5.064 | 4.50 | 78.860 | 5.526 | 0.979 | 0.847 | 930.100 | 1128.240 | 1126.680 |
| L480 | 80.581 | 5.067 | 4.50 | 78.860 | 5.444 | 0.979 | 0.868 | 857.600 | 1126.680 | 1125.240 |
| L481 | 105.950 | 4.460 | 5.50 | 86.310 | 4.793 | 0.815 | 0.710 | 813.700 | 1125.240 | 1124.430 |
| L482 | 106.353 | 4.476 | 5.50 | 86.310 | 4.795 | 0.812 | 0.709 | 757.700 | 1124.430 | 1123.670 |
| L483 | 106.105 | 4.466 | 5.50 | 86.310 | 4.789 | 0.813 | 0.710 | 791.300 | 1123.670 | 1122.880 |
| L484 | 105.940 | 4.459 | 5.50 | 86.310 | 4.793 | 0.815 | 0.710 | 653.100 | 1122.880 | 1122.230 |
| L485 | 106.343 | 4.476 | 5.50 | 86.310 | 4.796 | 0.812 | 0.709 | 737.900 | 1122.230 | 1121.490 |
| L486 | 106.166 | 4.469 | 5.50 | 86.310 | 4.787 | 0.813 | 0.710 | 800.400 | 1121.490 | 1120.690 |
| L487 | 105.840 | 4.455 | 5.50 | 86.310 | 4.784 | 0.815 | 0.710 | 694.600 | 1120.690 | 1120.000 |
| L488 | 105.972 | 4.460 | 5.50 | 86.310 | 4.790 | 0.814 | 0.710 | 773.200 | 1120.000 | 1119.230 |
| L489 | 106.287 | 4.474 | 5.50 | 86.310 | 4.781 | 0.812 | 0.713 | 838.500 | 1119.230 | 1118.390 |
| L490 | 106.135 | 4.467 | 5.50 | 86.310 | 4.697 | 0.813 | 0.735 | 830.900 | 1118.390 | 1117.560 |
| L491 | 105.823 | 4.454 | 5.50 | 86.310 | 4.387 | 0.816 | 0.820 | 735.100 | 1117.560 | 1116.830 |
| L524 | 106.199 | 4.470 | 5.50 | 86.310 | 3.904 | 0.813 | 0.985 | 809.900 | 1116.830 | 1116.020 |
| L525 | 195.327 | 5.075 | 7.00 | 176.300 | 5.979 | 0.903 | 0.774 | 973.400 | 1116.020 | 1115.110 |
| L526 | 195.452 | 5.079 | 7.00 | 176.300 | 5.518 | 0.902 | 0.775 | 566.200 | 1115.110 | 1114.580 |
| L527 | 194.793 | 5.062 | 7.00 | 176.300 | 5.527 | 0.905 | 0.775 | 602.300 | 1114.580 | 1114.020 |
| L528 | 196.758 | 5.113 | 7.00 | 176.300 | 5.524 | 0.896 | 0.776 | 632.500 | 1114.020 | 1113.420 |
| L529 | 194.964 | 5.066 | 7.00 | 176.300 | 5.495 | 0.904 | 0.779 | 676.400 | 1113.420 | 1112.790 |
| L535 | 195.586 | 5.082 | 7.00 | 177.830 | 5.538 | 0.909 | 0.779 | 810.800 | 1112.790 | 1112.030 |
| L536 | 195.808 | 5.088 | 7.00 | 177.830 | 5.557 | 0.908 | 0.777 | 915.400 | 1112.030 | 1111.170 |
| L537 | 195.517 | 5.080 | 7.00 | 177.830 | 5.652 | 0.910 | 0.773 | 843.400 | 1111.170 | 1110.380 |
| L538 | 195.344 | 5.076 | 7.00 | 177.830 | 6.959 | 0.910 | 0.749 | 834.200 | 1110.380 | 1109.600 |

APPENDIX F

Model Run No. 3 Estimated Cost Data



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

DATE :

LOCATION : LINCOLN, NEBRASKA

BY : MJS

ELEMENT : 03 - SEGMENT 3 - E-5C:E-5D

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|--------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 0 | LS | | | \$12,000 | \$0.00 | |
| | </= 36" diameter | 3 | LS | | | \$3,500 | \$10,500.00 | |
| | TUNNELING | | | | | | | |
| | for 30-INCH PIPE | 155 | LF | | | \$450 | \$69,750.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$80,250 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 30-INCH | 2,700 | LF | \$70.00 | \$129.50 | \$200 | \$538,650.00 | |
| | Permanent Easement | 108,000 | sq ft | \$0.50 | | \$0.50 | \$54,000.00 | |
| | Construction Easement | 432,000 | sq ft | \$0.05 | | \$0.05 | \$21,600.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$614,250 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$769,500 |
| | CONTINGENCY | | | | | | 25.00% | \$192,375 |
| | SUBTOTAL | | | | | | | \$961,875 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$96,188 |
| | SUBTOTAL | | | | | | | \$1,058,063 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$1,058,063 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$211,613 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$1,269,675 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

CLASS: _____
LOCATION FACTOR: 0.85

JOB # : 6903A.10

DATE : _____

LOCATION : LINCOLN, NEBRASKA

BY : MJS

ELEMENT : 04 - SEGMENT 4 - E-5D:E-5E

REVIEWED BY: _____

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|-----------|--|---------|-------|----------|----------|-----------|--------------|-------------|
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 0 | LS | | | \$12,000 | \$0.00 | |
| | </= 36" diameter | 7 | LS | | | \$3,500 | \$24,500.00 | |
| | TUNNELING | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$24,500 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 30-INCH | 3,150 | LF | \$70.00 | \$129.50 | \$200 | \$628,425.00 | |
| | 36-INCH | 625 | LF | \$86.00 | \$159.10 | \$245 | \$153,187.50 | |
| | Permanent Easement | 151,000 | sq ft | \$0.50 | | \$0.50 | \$75,500.00 | |
| | Construction Easement | 604,000 | sq ft | \$0.05 | | \$0.05 | \$30,200.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$887,313 |
| | TOTAL DIRECT COST | | | | | | | \$986,813 |
| | CONTINGENCY | | | | | 25.00% | \$246,703 | |
| | SUBTOTAL | | | | | | | \$1,233,516 |
| | GENERAL CONDITIONS | | | | | 10.00% | \$123,352 | |
| | SUBTOTAL | | | | | | | \$1,356,867 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$1,356,867 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$271,373 | |

| | | | | | | | |
|------------------------------|--|--|--|--|--|--|-------------|
| TOTAL ESTIMATED PROJECT COST | | | | | | | \$1,628,241 |
|------------------------------|--|--|--|--|--|--|-------------|



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 05 - SEGMENT 5 - E-5E:E-5F

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 0 | LS | | | \$12,000 | \$0.00 | |
| | </= 36" diameter | 6 | LS | | | \$3,500 | \$21,000.00 | |
| | TUNNELING | | | | | | | |
| | for 36-INCH PIPE | 150 | LF | | | \$540 | \$81,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$102,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 36-INCH | 4,850 | LF | \$86.00 | \$159.10 | \$245 | \$1,188,735.00 | |
| | Permanent Easement | 194,000 | sq ft | \$0.50 | | \$0.50 | \$97,000.00 | |
| | Construction Easement | 776,000 | sq ft | \$0.05 | | \$0.05 | \$38,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$1,324,535 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$1,501,535 |
| | CONTINGENCY | | | | | | 25.00% | \$375,384 |
| | SUBTOTAL | | | | | | | \$1,876,919 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$187,692 |
| | SUBTOTAL | | | | | | | \$2,064,611 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$2,064,611 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$412,922 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$2,477,533 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 06 - SEGMENT 6 - E-5F:E-5G

DATE :

BY : MJS

REVIEWED BY:



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 07 - SEGMENT 7 - E-5G:E-5H

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|--------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 0 | LS | | | \$12,000 | \$0.00 | |
| | </= 36" diameter | 3 | LS | | | \$3,500 | \$10,500.00 | |
| | TUNNELING | | | | | | | |
| | for 36-INCH PIPE | 150 | LF | | | \$540 | \$81,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$91,500 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 36-INCH | 2,100 | LF | \$86.00 | \$159.10 | \$245 | \$514,710.00 | |
| | Permanent Easement | 84,000 | sq ft | \$0.50 | | \$0.50 | \$42,000.00 | |
| | Construction Easement | 336,000 | sq ft | \$0.05 | | \$0.05 | \$16,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$573,510 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$740,010 |
| | CONTINGENCY | | | | | 25.00% | \$185,003 | |
| | SUBTOTAL | | | | | | | \$925,013 |
| | GENERAL CONDITIONS | | | | | 10.00% | \$92,501 | |
| | SUBTOTAL | | | | | | | \$1,017,514 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$1,017,514 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$203,503 | |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$1,221,017 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

CLASS: _____
LOCATION FACTOR: 0.85

JOB # : 6903A.10

DATE : _____

LOCATION : LINCOLN, NEBRASKA

BY : MJS

ELEMENT : 08 - SEGMENT 8 - E-5H:E-4

REVIEWED BY: _____

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|-----------|--|-----------|-------|----------|----------|-----------|----------------|--------------------|
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 4 | LS | | | \$12,000 | \$48,000.00 | |
| | </= 36" diameter | 4 | LS | | | \$3,500 | \$14,000.00 | |
| | TUNNELING | | | | | | | |
| | for 36-INCH PIPE | 150 | LF | | | \$540 | \$81,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$143,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 36-INCH | 3,025 | LF | \$86.00 | \$159.10 | \$245 | \$741,427.50 | |
| | 48-INCH | 3,250 | LF | \$127.00 | \$234.95 | \$362 | \$1,176,337.50 | |
| | Permanent Easement | 251,000 | sq ft | \$0.50 | | \$0.50 | \$125,500.00 | |
| | Construction Easement | 1,004,000 | sq ft | \$0.05 | | \$0.05 | \$50,200.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$2,093,465 |
| | TOTAL DIRECT COST | | | | | | | \$2,168,465 |
| | CONTINGENCY | | | | | 25.00% | \$542,116 | |
| | SUBTOTAL | | | | | | | \$2,710,581 |
| | GENERAL CONDITIONS | | | | | 10.00% | \$271,058 | |
| | SUBTOTAL | | | | | | | \$2,981,639 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$2,981,639 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$596,328 | |

TOTAL ESTIMATED PROJECT COST \$3,577,967



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 09 - SEGMENT 9 - E-4:E-3A

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|-----------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 8 | LS | | | \$12,000 | \$96,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | | | | | | | | |
| | TUNNELING | | | | | | | |
| | for 48-INCH PIPE | 350 | LF | | | \$720 | \$252,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$348,000 |
| | | | | | | | | |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| | | | | | | | | |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 48-INCH | 7,410 | LF | \$127.00 | \$234.95 | \$362 | \$2,682,049.50 | |
| | Permanent Easement | 296,400 | sq ft | \$0.50 | | \$0.50 | \$148,200.00 | |
| | Construction Easement | 1,185,600 | sq ft | \$0.05 | | \$0.05 | \$59,280.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$2,889,530 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$2,964,530 |
| | CONTINGENCY | | | | | | 25.00% | \$741,132 |
| | SUBTOTAL | | | | | | | \$3,705,662 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$370,566 |
| | SUBTOTAL | | | | | | | \$4,076,228 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$4,076,228 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$815,246 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$4,891,474 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 10 - SEGMENT 10 - E-3A:E-3E

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 5 | LS | | | \$12,000 | \$60,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | for 54-INCH PIPE | 320 | LF | | | \$810 | \$259,200.00 | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$319,200 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 54-INCH | 4,050 | LF | \$147.00 | \$271.95 | \$419 | \$1,696,747.50 | |
| | Permanent Easement | 162,000 | sq ft | \$0.50 | | \$0.50 | \$81,000.00 | |
| | Construction Easement | 648,000 | sq ft | \$0.05 | | \$0.05 | \$32,400.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$1,810,148 |
| | TOTAL DIRECT COST | | | | | | | \$2,204,348 |
| | CONTINGENCY | | | | | | 25.00% | \$551,087 |
| | SUBTOTAL | | | | | | | \$2,755,434 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$275,543 |
| | SUBTOTAL | | | | | | | \$3,030,978 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$3,030,978 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$606,196 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$3,637,173 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 11 - SEGMENT 11 - E-3B:E-2

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 9 | LS | | | \$12,000 | \$108,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | for 54-INCH PIPE | 305 | LF | | | \$810 | \$247,050.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$355,050 |
| | | | | | | | | |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| | | | | | | | | |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 54-INCH | 6,225 | LF | \$147.00 | \$271.95 | \$419 | \$2,607,963.75 | |
| | Permanent Easement | 249,000 | sq ft | \$0.50 | | \$0.50 | \$124,500.00 | |
| | Construction Easement | 996,000 | sq ft | \$0.05 | | \$0.05 | \$49,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$2,782,264 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$3,212,314 |
| | CONTINGENCY | | | | | | 25.00% | \$803,078 |
| | SUBTOTAL | | | | | | | \$4,015,392 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$401,539 |
| | SUBTOTAL | | | | | | | \$4,416,931 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$4,416,931 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$883,386 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$5,300,318 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 12 - SUBBASIN E-2

CLASS: **LOCATION FACTOR:** 0.85

DATE : 6/1/2004

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|-----------|--|-----------|-------|----------|---------|-----------|--------------|--------------------|
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | </= 36" diameter | 8 | EA | | | \$3,500 | \$28,000.00 | |
| | | | | | | | | |
| | TUNNELING | | | | | | | |
| | for 24-INCH PIPE | 150 | LF | | | \$360 | \$54,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$82,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 4 | LS | | | \$75,000 | \$300,000.00 | |
| | | | | | | | | |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 18-INCH | 3,150 | LF | \$40.00 | \$74.00 | \$114 | \$359,100.00 | |
| | 24-INCH | 5,122 | LF | \$54.00 | \$99.90 | \$154 | \$788,275.80 | |
| | Permanent Easement | 330,880 | sq ft | \$0.50 | | \$0.50 | \$165,440.00 | |
| | Construction Easement | 1,323,520 | sq ft | \$0.05 | | \$0.05 | \$66,176.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$1,378,992 |
| | TOTAL DIRECT COST | | | | | | | \$1,460,992 |
| | CONTINGENCY | | | | | | 25.00% | \$365,248 |
| | SUBTOTAL | | | | | | | \$1,826,240 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$182,624 |
| | SUBTOTAL | | | | | | | \$2,008,864 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$2,008,864 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$401,773 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$2,410,636 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 13 - SEGMENT 12 - E-2:E-1

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|-----------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 14 | LS | | | \$12,000 | \$168,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | for 54-INCH PIPE | 500 | LF | | | \$810 | \$405,000.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$573,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 54-INCH | 11,000 | LF | \$147.00 | \$271.95 | \$419 | \$4,608,450.00 | |
| | Permanent Easement | 440,000 | sq ft | \$0.50 | | \$0.50 | \$220,000.00 | |
| | Construction Easement | 1,760,000 | sq ft | \$0.05 | | \$0.05 | \$88,000.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$4,916,450 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$5,564,450 |
| | CONTINGENCY | | | | | | 25.00% | \$1,391,113 |
| | SUBTOTAL | | | | | | | \$6,955,563 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$695,556 |
| | SUBTOTAL | | | | | | | \$7,651,119 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$7,651,119 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$1,530,224 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$9,181,343 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 14 - SEGMENT 13 - E-1:E-11/-6

CLASS: _____
LOCATION FACTOR: _____ 0.85

DATE : _____

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|-----------|-------|----------|----------|-----------|--------------------|---------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 10 | LS | | | \$12,000 | \$120,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | for 66-INCH PIPE | 520 | LF | | | \$990 | \$514,800.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$634,800 |
| | | | | | | | | |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| | | | | | | | | |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 66-INCH | 9,300 | LF | \$205.00 | \$379.25 | \$584 | \$5,433,525.00 | |
| | Permanent Easement | 372,000 | sq ft | \$0.50 | | \$0.50 | \$186,000.00 | |
| | Construction Easement | 1,488,000 | sq ft | \$0.05 | | \$0.05 | \$74,400.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$5,693,925 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$6,403,725 |
| | CONTINGENCY | | | | | 25.00% | \$1,600,931 | |
| | SUBTOTAL | | | | | | \$8,004,656 | |
| | GENERAL CONDITIONS | | | | | 10.00% | \$800,466 | |
| | SUBTOTAL | | | | | | \$8,805,122 | |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$8,805,122 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$1,761,024 | |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$10,566,146 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

LOCATION : LINCOLN, NEBRASKA

ELEMENT : 16 - SEGMENT 15 - E-11/E-6:-12

DATE :

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|-----------|--|---------|-------|----------|----------|-----------|----------------|--------------------|
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 4 | LS | | | \$12,000 | \$48,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | for 84-INCH PIPE | 525 | LF | | | \$1,260 | \$661,500.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$709,500 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 84-INCH | 3,600 | LF | \$289.00 | \$534.65 | \$824 | \$2,965,140.00 | |
| | Permanent Easement | 144,000 | sq ft | \$0.50 | | \$0.50 | \$72,000.00 | |
| | Construction Easement | 576,000 | sq ft | \$0.05 | | \$0.05 | \$28,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$3,065,940 |
| | TOTAL DIRECT COST | | | | | | | \$3,850,440 |
| | CONTINGENCY | | | | | | 25.00% | \$962,610 |
| | SUBTOTAL | | | | | | | \$4,813,050 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$481,305 |
| | SUBTOTAL | | | | | | | \$5,294,355 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$5,294,355 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$1,058,871 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$6,353,226 |



DETAILED COST ESTIMATE

PROJECT : STEVENS CREEK BASIN TRUNK SEWER

JOB # : 6903A.10

DATE :

LOCATION : LINCOLN, NEBRASKA

BY : MJS

ELEMENT : 17 - SEGMENT 16 - E-12:WW

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|---------|-------|----------|----------|-----------|----------------|--------------------|
| | | | | | | | | |
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 3 | LS | | | \$12,000 | \$36,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$36,000 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 1 | LS | | | \$75,000 | \$75,000.00 | |
| | SUBTOTAL CONCRETE | | | | | | | \$75,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 84-INCH | 4,100 | LF | \$289.00 | \$534.65 | \$824 | \$3,376,965.00 | |
| | Permanent Easement | 164,000 | sq ft | \$0.50 | | \$0.50 | \$82,000.00 | |
| | Construction Easement | 656,000 | sq ft | \$0.05 | | \$0.05 | \$32,800.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$3,491,765 |
| | | | | | | | | |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$3,602,765 |
| | CONTINGENCY | | | | | | 25.00% | \$900,691 |
| | SUBTOTAL | | | | | | | \$4,503,456 |
| | GENERAL CONDITIONS | | | | | | 10.00% | \$450,346 |
| | SUBTOTAL | | | | | | | \$4,953,802 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$4,953,802 |
| | ENGINEERING & LEGAL FEES | | | | | | 20.00% | \$990,760 |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$5,944,562 |

APPENDIX G

Model Run No. 4 Output

APPENDIX G

XP SWMM RESULTS FOR MODEL RUN NO. 4 (WESTSIDE + SUBBASIN E-6 W/EASTSIDE AT JCT STRUCTURE E-7)

Model Run - 4

| Link Name | Design Full Flow (ft^3/s) | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design Flow | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|---------------------------|------------------------|---------------|-------------------|---------------------|----------------------|-------|-------------|----------------|----------------|
| L1 | 6.150 | 5.012 | 1.250 | 3.870 | 6.784 | 0.629 | 0.594 | 1159.400 | 1395.000 | 1384.490 |
| L2 | 6.153 | 5.014 | 1.250 | 3.860 | 5.629 | 0.627 | 0.591 | 773.700 | 1384.490 | 1377.470 |
| L3 | 6.150 | 5.012 | 1.250 | 3.860 | 5.441 | 0.628 | 0.591 | 610.100 | 1377.470 | 1371.940 |
| L4 | 6.155 | 5.015 | 1.250 | 3.860 | 5.470 | 0.627 | 0.591 | 751.300 | 1371.940 | 1365.120 |
| L5 | 6.150 | 5.011 | 1.250 | 3.860 | 5.228 | 0.628 | 0.591 | 751.400 | 1365.120 | 1358.310 |
| L6 | 6.152 | 5.013 | 1.250 | 3.860 | 5.171 | 0.627 | 0.591 | 462.000 | 1358.310 | 1354.120 |
| L7 | 6.149 | 5.010 | 1.250 | 3.860 | 5.223 | 0.628 | 0.591 | 641.300 | 1354.120 | 1348.310 |
| L8 | 6.154 | 5.015 | 1.250 | 3.860 | 5.279 | 0.627 | 0.591 | 588.300 | 1348.310 | 1342.970 |
| L9 | 6.150 | 5.012 | 1.250 | 3.860 | 5.180 | 0.628 | 0.591 | 744.600 | 1342.970 | 1336.220 |
| L10 | 6.156 | 5.016 | 1.250 | 3.860 | 5.180 | 0.627 | 0.591 | 443.800 | 1336.220 | 1332.190 |
| L11 | 6.151 | 5.012 | 1.250 | 3.860 | 5.340 | 0.628 | 0.592 | 782.000 | 1332.190 | 1325.100 |
| L12 | 6.148 | 5.010 | 1.250 | 3.860 | 5.604 | 0.628 | 0.592 | 690.000 | 1325.100 | 1318.850 |
| L13 | 6.154 | 5.015 | 1.250 | 3.860 | 4.583 | 0.627 | 0.730 | 802.200 | 1318.850 | 1311.570 |
| L22 | 10.001 | 5.659 | 1.500 | 6.560 | 5.826 | 0.656 | 0.609 | 474.400 | 1311.570 | 1307.270 |
| L23 | 9.999 | 5.658 | 1.500 | 6.560 | 5.828 | 0.656 | 0.609 | 573.900 | 1307.270 | 1302.070 |
| L24 | 10.006 | 5.662 | 1.500 | 6.560 | 5.829 | 0.656 | 0.609 | 553.300 | 1302.070 | 1297.050 |
| L25 | 10.004 | 5.661 | 1.500 | 6.560 | 5.825 | 0.656 | 0.609 | 582.100 | 1297.050 | 1291.770 |
| L26 | 9.993 | 5.655 | 1.500 | 6.560 | 5.846 | 0.656 | 0.609 | 424.300 | 1291.770 | 1287.930 |
| L27 | 10.006 | 5.662 | 1.500 | 6.560 | 5.461 | 0.656 | 0.692 | 759.400 | 1287.930 | 1281.040 |
| L39 | 21.540 | 6.856 | 2.000 | 10.950 | 6.653 | 0.508 | 0.519 | 647.500 | 1281.040 | 1275.170 |
| L40 | 21.539 | 6.856 | 2.000 | 10.950 | 6.654 | 0.508 | 0.519 | 798.700 | 1275.170 | 1267.930 |
| L41 | 21.550 | 6.860 | 2.000 | 10.950 | 6.651 | 0.508 | 0.519 | 667.800 | 1267.930 | 1261.870 |
| L42 | 21.545 | 6.858 | 2.000 | 10.950 | 6.741 | 0.508 | 0.519 | 560.100 | 1261.870 | 1256.790 |
| L43 | 21.544 | 6.858 | 2.000 | 10.950 | 4.840 | 0.508 | 0.948 | 769.600 | 1256.790 | 1249.810 |
| L108 | 25.109 | 5.115 | 2.500 | 22.180 | 5.569 | 0.883 | 0.759 | 680.500 | 1249.810 | 1247.260 |
| L109 | 25.147 | 5.123 | 2.500 | 22.180 | 5.569 | 0.882 | 0.758 | 681.100 | 1247.260 | 1244.700 |
| L110 | 25.177 | 5.129 | 2.500 | 22.180 | 5.563 | 0.881 | 0.759 | 525.500 | 1244.700 | 1242.720 |
| L111 | 25.114 | 5.116 | 2.500 | 22.180 | 5.461 | 0.883 | 0.792 | 525.500 | 1242.720 | 1240.750 |
| L112 | 25.062 | 5.106 | 2.500 | 23.170 | 5.582 | 0.925 | 0.792 | 862.500 | 1240.750 | 1237.530 |
| L118 | 25.082 | 5.110 | 2.500 | 23.170 | 5.571 | 0.924 | 0.793 | 601.700 | 1237.530 | 1235.280 |
| L119 | 25.092 | 5.112 | 2.500 | 23.170 | 6.008 | 0.923 | 0.793 | 547.800 | 1235.280 | 1233.230 |
| L120 | 40.781 | 5.769 | 3.000 | 23.170 | 5.757 | 0.568 | 0.555 | 607.200 | 1233.230 | 1230.960 |
| L121 | 40.942 | 5.792 | 3.000 | 23.170 | 5.760 | 0.566 | 0.555 | 265.400 | 1230.960 | 1229.960 |
| L122 | 40.794 | 5.771 | 3.000 | 23.170 | 5.733 | 0.568 | 0.558 | 259.300 | 1229.960 | 1228.990 |
| L135 | 40.372 | 5.711 | 3.000 | 23.170 | 5.725 | 0.574 | 0.558 | 92.800 | 1228.990 | 1228.650 |
| L140 | 40.875 | 5.783 | 3.000 | 23.170 | 5.488 | 0.567 | 0.603 | 221.000 | 1228.650 | 1227.820 |
| L141 | 39.381 | 5.571 | 3.000 | 25.450 | 5.719 | 0.646 | 0.603 | 502.000 | 1227.820 | 1226.070 |
| L142 | 39.391 | 5.573 | 3.000 | 25.450 | 5.718 | 0.646 | 0.603 | 931.800 | 1226.070 | 1222.820 |
| L143 | 39.355 | 5.568 | 3.000 | 25.450 | 5.719 | 0.647 | 0.603 | 715.200 | 1222.820 | 1220.330 |

APPENDIX G

XP SWMM RESULTS FOR MODEL RUN NO. 4 (WESTSIDE + SUBBASIN E-6 W/EASTSIDE AT JCT STRUCTURE E-7)

| | | | | | | | | | | |
|------|--------|-------|-------|--------|-------|-------|-------|---------|----------|----------|
| L144 | 39.422 | 5.577 | 3.000 | 25.450 | 5.720 | 0.646 | 0.603 | 855.900 | 1220.330 | 1217.340 |
| L145 | 39.354 | 5.567 | 3.000 | 25.450 | 5.717 | 0.647 | 0.603 | 887.600 | 1217.340 | 1214.250 |
| L146 | 39.395 | 5.573 | 3.000 | 25.450 | 5.720 | 0.646 | 0.603 | 719.500 | 1214.250 | 1211.740 |
| L147 | 39.388 | 5.572 | 3.000 | 25.450 | 5.640 | 0.646 | 0.619 | 564.900 | 1211.740 | 1209.770 |
| L153 | 39.352 | 5.567 | 3.000 | 26.440 | 5.763 | 0.672 | 0.619 | 548.700 | 1209.770 | 1207.860 |
| L154 | 39.399 | 5.574 | 3.000 | 26.440 | 5.759 | 0.671 | 0.619 | 679.200 | 1207.860 | 1205.490 |
| L155 | 39.319 | 5.563 | 3.000 | 26.440 | 5.684 | 0.672 | 0.633 | 230.200 | 1205.490 | 1204.690 |
| L160 | 39.376 | 5.571 | 3.000 | 27.390 | 5.808 | 0.696 | 0.633 | 381.600 | 1204.690 | 1203.360 |
| L161 | 39.410 | 5.575 | 3.000 | 27.390 | 5.807 | 0.695 | 0.633 | 761.900 | 1203.360 | 1200.700 |
| L162 | 39.359 | 5.568 | 3.000 | 27.390 | 5.805 | 0.696 | 0.633 | 712.200 | 1200.700 | 1198.220 |
| L163 | 39.364 | 5.569 | 3.000 | 27.390 | 5.766 | 0.696 | 0.642 | 654.600 | 1198.220 | 1195.940 |
| L168 | 39.395 | 5.573 | 3.000 | 27.940 | 5.829 | 0.709 | 0.642 | 788.300 | 1195.940 | 1193.190 |
| L169 | 39.332 | 5.564 | 3.000 | 27.940 | 5.829 | 0.710 | 0.642 | 874.200 | 1193.190 | 1190.150 |
| L170 | 39.409 | 5.575 | 3.000 | 27.940 | 5.828 | 0.709 | 0.643 | 707.500 | 1190.150 | 1187.680 |
| L171 | 39.296 | 5.559 | 3.000 | 27.940 | 5.811 | 0.711 | 0.645 | 527.200 | 1187.680 | 1185.850 |
| L249 | 39.407 | 5.575 | 3.000 | 27.940 | 5.049 | 0.709 | 0.851 | 487.000 | 1185.850 | 1184.150 |
| L250 | 66.490 | 5.291 | 4.000 | 46.810 | 5.537 | 0.704 | 0.638 | 812.100 | 1184.150 | 1182.410 |
| L251 | 66.776 | 5.314 | 4.000 | 46.810 | 5.537 | 0.701 | 0.639 | 712.600 | 1182.410 | 1180.870 |
| L252 | 66.419 | 5.285 | 4.000 | 46.810 | 5.535 | 0.705 | 0.639 | 696.900 | 1180.870 | 1179.380 |
| L253 | 66.778 | 5.314 | 4.000 | 46.810 | 5.540 | 0.701 | 0.638 | 684.800 | 1179.380 | 1177.900 |
| L254 | 66.532 | 5.294 | 4.000 | 46.810 | 5.531 | 0.704 | 0.638 | 722.500 | 1177.900 | 1176.350 |
| L255 | 66.583 | 5.299 | 4.000 | 46.810 | 5.773 | 0.703 | 0.638 | 954.100 | 1176.350 | 1174.300 |
| L256 | 91.087 | 5.727 | 4.500 | 46.810 | 5.576 | 0.514 | 0.522 | 857.600 | 1174.300 | 1172.460 |
| L257 | 91.272 | 5.739 | 4.500 | 46.810 | 5.575 | 0.513 | 0.522 | 817.000 | 1172.460 | 1170.700 |
| L258 | 91.031 | 5.724 | 4.500 | 46.810 | 5.572 | 0.514 | 0.522 | 840.000 | 1170.700 | 1168.900 |
| L259 | 91.181 | 5.733 | 4.500 | 46.810 | 5.576 | 0.513 | 0.522 | 897.700 | 1168.900 | 1166.970 |
| L260 | 91.182 | 5.733 | 4.500 | 46.810 | 5.579 | 0.513 | 0.522 | 762.800 | 1166.970 | 1165.330 |
| L261 | 91.314 | 5.741 | 4.500 | 46.810 | 5.554 | 0.513 | 0.526 | 871.900 | 1165.330 | 1163.450 |
| L262 | 91.055 | 5.725 | 4.500 | 46.810 | 4.670 | 0.514 | 0.701 | 769.600 | 1163.450 | 1161.800 |
| L263 | 83.063 | 5.223 | 4.500 | 66.580 | 5.591 | 0.802 | 0.701 | 801.500 | 1161.800 | 1160.370 |
| L362 | 83.099 | 5.225 | 4.500 | 66.580 | 5.589 | 0.801 | 0.702 | 744.800 | 1160.370 | 1159.040 |
| L363 | 82.948 | 5.215 | 4.500 | 66.580 | 5.591 | 0.803 | 0.702 | 713.800 | 1159.040 | 1157.770 |
| L364 | 83.207 | 5.232 | 4.500 | 66.580 | 5.596 | 0.800 | 0.701 | 502.700 | 1157.770 | 1156.870 |
| L365 | 83.133 | 5.227 | 4.500 | 66.580 | 5.589 | 0.801 | 0.702 | 498.000 | 1156.870 | 1155.980 |
| L366 | 83.109 | 5.226 | 4.500 | 66.580 | 5.493 | 0.801 | 0.726 | 834.200 | 1155.980 | 1154.490 |
| L367 | 83.147 | 5.228 | 4.500 | 69.650 | 5.632 | 0.838 | 0.727 | 950.900 | 1154.490 | 1152.790 |
| L378 | 83.041 | 5.221 | 4.500 | 69.650 | 5.634 | 0.839 | 0.727 | 925.300 | 1152.790 | 1151.140 |
| L379 | 83.371 | 5.242 | 4.500 | 69.650 | 5.634 | 0.835 | 0.727 | 367.200 | 1151.140 | 1150.480 |
| L380 | 82.940 | 5.215 | 4.500 | 69.650 | 5.629 | 0.840 | 0.727 | 286.700 | 1150.480 | 1149.970 |
| L381 | 83.174 | 5.230 | 4.500 | 69.650 | 5.635 | 0.837 | 0.726 | 609.300 | 1149.970 | 1148.880 |
| L382 | 83.201 | 5.231 | 4.500 | 69.650 | 5.632 | 0.837 | 0.727 | 569.800 | 1148.880 | 1147.860 |
| L383 | 83.086 | 5.224 | 4.500 | 69.650 | 5.622 | 0.838 | 0.728 | 638.600 | 1147.860 | 1146.720 |

APPENDIX G

XP SWMM RESULTS FOR MODEL RUN NO. 4 (WESTSIDE + SUBBASIN E-6 W/EASTSIDE AT JCT STRUCTURE E-7)

| | | | | | | | | | | |
|------|---------|-------|-------|---------|-------|-------|-------|---------|----------|----------|
| L384 | 82.773 | 5.204 | 4.500 | 69.650 | 5.622 | 0.841 | 0.728 | 344.300 | 1146.720 | 1146.110 |
| L385 | 83.220 | 5.233 | 4.500 | 69.650 | 5.597 | 0.837 | 0.736 | 686.800 | 1146.110 | 1144.880 |
| L386 | 83.179 | 5.230 | 4.500 | 69.650 | 5.231 | 0.837 | 0.843 | 726.600 | 1144.880 | 1143.580 |
| L437 | 80.634 | 5.070 | 4.500 | 78.860 | 5.542 | 0.978 | 0.845 | 898.100 | 1143.580 | 1142.070 |
| L438 | 80.518 | 5.063 | 4.500 | 78.860 | 5.524 | 0.979 | 0.850 | 847.000 | 1142.070 | 1140.650 |
| L439 | 80.409 | 5.056 | 4.500 | 78.860 | 5.438 | 0.981 | 0.872 | 723.700 | 1140.650 | 1139.440 |
| L440 | 80.534 | 5.064 | 4.500 | 78.860 | 5.225 | 0.979 | 0.946 | 524.700 | 1139.440 | 1138.560 |
| L441 | 173.993 | 6.154 | 6.000 | 141.550 | 7.033 | 0.814 | 0.711 | 793.900 | 1138.560 | 1137.220 |
| L442 | 173.576 | 6.139 | 6.000 | 141.550 | 6.585 | 0.815 | 0.711 | 762.000 | 1137.220 | 1135.940 |
| L443 | 173.355 | 6.131 | 6.000 | 141.550 | 6.585 | 0.817 | 0.711 | 716.200 | 1135.940 | 1134.740 |
| L444 | 173.550 | 6.138 | 6.000 | 141.550 | 6.593 | 0.816 | 0.711 | 607.400 | 1134.740 | 1133.720 |
| L445 | 173.802 | 6.147 | 6.000 | 141.550 | 6.609 | 0.814 | 0.710 | 552.200 | 1133.720 | 1132.790 |
| L446 | 173.137 | 6.123 | 6.000 | 141.550 | 6.841 | 0.818 | 0.707 | 646.200 | 1132.790 | 1131.710 |
| L447 | 214.592 | 6.467 | 6.500 | 141.550 | 6.677 | 0.660 | 0.611 | 978.900 | 1131.710 | 1130.070 |
| L448 | 215.689 | 6.500 | 6.500 | 141.550 | 6.676 | 0.656 | 0.611 | 567.200 | 1130.070 | 1129.110 |
| L449 | 214.405 | 6.461 | 6.500 | 141.550 | 6.660 | 0.660 | 0.611 | 520.200 | 1129.110 | 1128.240 |
| L450 | 214.713 | 6.471 | 6.500 | 141.550 | 6.577 | 0.659 | 0.626 | 930.100 | 1128.240 | 1126.680 |
| L480 | 214.832 | 6.474 | 6.500 | 141.550 | 5.814 | 0.659 | 0.770 | 857.600 | 1126.680 | 1125.240 |
| L481 | 165.414 | 4.985 | 6.500 | 148.660 | 5.430 | 0.899 | 0.770 | 813.700 | 1125.240 | 1124.430 |
| L482 | 166.042 | 5.004 | 6.500 | 148.660 | 5.432 | 0.895 | 0.770 | 757.700 | 1124.430 | 1123.670 |
| L483 | 165.655 | 4.992 | 6.500 | 148.660 | 5.425 | 0.897 | 0.770 | 791.300 | 1123.670 | 1122.880 |
| L484 | 165.397 | 4.984 | 6.500 | 148.660 | 5.429 | 0.899 | 0.770 | 653.100 | 1122.880 | 1122.230 |
| L485 | 166.027 | 5.003 | 6.500 | 148.660 | 5.432 | 0.895 | 0.770 | 737.900 | 1122.230 | 1121.490 |
| L486 | 165.750 | 4.995 | 6.500 | 148.660 | 5.422 | 0.897 | 0.771 | 800.400 | 1121.490 | 1120.690 |
| L487 | 165.241 | 4.980 | 6.500 | 148.660 | 5.420 | 0.900 | 0.771 | 694.600 | 1120.690 | 1120.000 |
| L488 | 165.448 | 4.986 | 6.500 | 148.660 | 5.428 | 0.899 | 0.770 | 773.200 | 1120.000 | 1119.230 |
| L489 | 165.939 | 5.001 | 6.500 | 148.660 | 5.427 | 0.896 | 0.771 | 838.500 | 1119.230 | 1118.390 |
| L490 | 165.701 | 4.994 | 6.500 | 148.660 | 5.408 | 0.897 | 0.775 | 830.900 | 1118.390 | 1117.560 |
| L491 | 165.215 | 4.979 | 6.500 | 148.660 | 5.360 | 0.900 | 0.785 | 735.100 | 1117.560 | 1116.830 |
| L524 | 165.801 | 4.997 | 6.500 | 148.660 | 5.186 | 0.897 | 0.834 | 809.900 | 1116.830 | 1116.020 |
| L525 | 195.327 | 5.075 | 7.000 | 176.310 | 5.520 | 0.903 | 0.774 | 973.400 | 1116.020 | 1115.110 |
| L526 | 195.452 | 5.079 | 7.000 | 176.310 | 5.518 | 0.902 | 0.775 | 566.200 | 1115.110 | 1114.580 |
| L527 | 194.793 | 5.062 | 7.000 | 176.310 | 5.527 | 0.905 | 0.775 | 602.300 | 1114.580 | 1114.020 |
| L528 | 196.758 | 5.113 | 7.000 | 176.310 | 5.524 | 0.896 | 0.777 | 632.500 | 1114.020 | 1113.420 |
| L529 | 194.964 | 5.066 | 7.000 | 176.310 | 5.495 | 0.904 | 0.779 | 676.400 | 1113.420 | 1112.790 |
| L535 | 195.586 | 5.082 | 7.000 | 177.840 | 5.538 | 0.909 | 0.779 | 810.800 | 1112.790 | 1112.030 |
| L536 | 195.808 | 5.088 | 7.000 | 177.840 | 5.557 | 0.908 | 0.777 | 915.400 | 1112.030 | 1111.170 |
| L537 | 195.517 | 5.080 | 7.000 | 177.840 | 5.652 | 0.910 | 0.773 | 843.400 | 1111.170 | 1110.380 |
| L538 | 195.344 | 5.076 | 7.000 | 177.840 | 6.959 | 0.910 | 0.749 | 834.200 | 1110.380 | 1109.600 |

APPENDIX H

Model Run No. 4 Estimated Cost Dat

APPENDIX H**DETAILED COST ESTIMATE FOR MODEL RUN NO. 4 (WESTSIDE + SUBBASIN E-6
W/EASTSIDE @ JCT STRUCTURE E-7)**

|  CAROLLO e n g i n e e r s | | PROJECT SUMMARY | |
|---|--|---------------------|-----------------|
| | | ESTIMATE CLASS: | 3 |
| PROJECT : | <u>STEVENS CREEK GRAVITY SEWER</u> | | |
| JOB # : | <u>6903A.10</u> | DATE : | <u>6/8/2004</u> |
| LOCATION : | <u>LINCOLN, NEBRASKA</u> | BY : | <u>MJS</u> |
| ELEMENT/ PHASE # | ELEMENT | COST | |
| 1/ PH IX | JCT BOX E-5A to JCT BOX E-5B; 3,400 LF OF 18" PIPE | \$1,038,345 | |
| 2/ PH IX | JCT BOX E-5B to JCT BOX E-5C; 3,450 LF OF 24" PIPE | \$1,182,316 | |
| 3/ PH VIII | JCT BOX E-5C to JCT BOX E-5D; 2,700 LF OF 30" PIPE | \$1,269,675 | |
| 4/ PH VIII | JCT BOX E-5D to JCT BOX E-5E; 3,700 LF OF 30"-36" PIPE | \$1,628,241 | |
| 5/ PH VIII | JCT BOX E-5E to JCT BOX E-5F; 4,850 LF OF 36" PIPE | \$2,477,533 | |
| 6/ PH VIII | JCT BOX E-5F to JCT BOX E-5G; 1,800 LF OF 36" PIPE | \$946,407 | |
| 7/ PH VII | JCT BOX E-5G to JCT BOX E-5H; 2,100 LF OF 36" PIPE | \$1,221,017 | |
| 8/ PH VII | JCT BOX E-5H to JCT BOX E-4; 6,200 LF OF 36"-48" PIPE | \$3,577,967 | |
| 9/ PH VI | JCT BOX E-4 to JCT BOX E-3A; 7,400 LF OF 48" PIPE | \$4,891,474 | |
| 10/ PH V | JCT BOX E-3A to JCT BOX E-3B; 4,000 LF OF 54" PIPE | \$3,637,173 | |
| 11/ PH V | JCT BOX E-3B to JCT BOX E-2; 6,200 LF OF 54" PIPE | \$5,300,318 | |
| 12/ PH IV | SUBBASIN E-2 TRIB SEWER; 8,300 LF OF 18"-24" PIPE | \$2,905,636 | |
| 13/ PH III | JCT BOX E-2 to JCT BOX E-7; 3,200 OF 60" PIPE | \$2,980,230 | |
| 14/ PH III | JCT BOX E-7 to JCT BOX E-1; 7,600 LF OF 72"-78" PIPE | \$10,361,736 | |
| 15/ PH II | JCT BOX E-1 to JCT BOX E-11/E-6; 9,300 LF OF 78" PIPE | \$12,661,407 | |
| 16/ PH I | JCT BOX E-11/E-6 to JCT BOX E-12; 3,600 LF OF 84" PIPE | \$6,041,376 | |
| 17/ PH I | JCT BOX E-12 TO NE WWTP; 4,100 LF OF 84" PIPE | \$5,944,562 | |
| | TOTAL ESTIMATED PROJECT COST | \$68,065,412 | |

APPENDIX I

Model Run No. 5 Output

APPENDIX I

XP SWMM RESULT FOR MODEL RUN NO. 5 (WEST/EAST PARALLEL)

| Link Name | Design Full Flow (ft^3/s) | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design Flow | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|---------------------------|------------------------|---------------|-------------------|---------------------|----------------------|-------|-------------|----------------|----------------|
| L700 | 9.348 | 5.290 | 1.50 | 7.223 | 7.695 | 0.773 | 0.684 | 481.050 | 1332.190 | 1328.380 |
| L701 | 9.348 | 5.290 | 1.50 | 7.202 | 6.698 | 0.770 | 0.680 | 560.580 | 1328.380 | 1323.940 |
| L702 | 9.339 | 5.285 | 1.50 | 7.200 | 5.979 | 0.771 | 0.680 | 436.480 | 1323.940 | 1320.490 |
| L703 | 9.345 | 5.288 | 1.50 | 7.201 | 6.034 | 0.771 | 0.680 | 295.640 | 1320.490 | 1318.150 |
| L704 | 9.345 | 5.288 | 1.50 | 7.202 | 6.131 | 0.771 | 0.680 | 605.230 | 1318.150 | 1313.360 |
| L705 | 9.357 | 5.295 | 1.50 | 7.201 | 6.007 | 0.770 | 0.680 | 448.690 | 1313.360 | 1309.800 |
| L706 | 9.346 | 5.289 | 1.50 | 7.201 | 6.094 | 0.771 | 0.680 | 596.240 | 1309.800 | 1305.080 |
| L707 | 9.342 | 5.287 | 1.50 | 7.201 | 6.026 | 0.771 | 0.680 | 646.040 | 1305.080 | 1299.970 |
| L708 | 9.345 | 5.288 | 1.50 | 7.200 | 5.854 | 0.771 | 0.680 | 626.750 | 1299.970 | 1295.010 |
| L709 | 9.349 | 5.290 | 1.50 | 7.200 | 5.798 | 0.770 | 0.680 | 506.270 | 1295.010 | 1291.000 |
| L710 | 9.353 | 5.292 | 1.50 | 7.200 | 5.882 | 0.770 | 0.680 | 595.410 | 1291.000 | 1286.280 |
| L711 | 9.342 | 5.287 | 1.50 | 7.200 | 5.799 | 0.771 | 0.680 | 646.040 | 1286.280 | 1281.170 |
| L712 | 9.350 | 5.291 | 1.50 | 7.200 | 5.768 | 0.770 | 0.680 | 518.730 | 1281.170 | 1277.060 |
| L713 | 9.343 | 5.287 | 1.50 | 7.200 | 5.850 | 0.771 | 0.680 | 634.540 | 1277.060 | 1272.040 |
| L714 | 9.350 | 5.291 | 1.50 | 7.200 | 5.747 | 0.770 | 0.680 | 658.840 | 1272.040 | 1266.820 |
| L715 | 9.343 | 5.287 | 1.50 | 7.200 | 5.681 | 0.771 | 0.680 | 495.490 | 1266.820 | 1262.900 |
| L716 | 9.344 | 5.287 | 1.50 | 7.200 | 5.683 | 0.771 | 0.680 | 324.810 | 1262.900 | 1260.330 |
| L717 | 9.345 | 5.288 | 1.50 | 7.200 | 5.729 | 0.770 | 0.680 | 476.310 | 1260.330 | 1256.560 |
| L718 | 9.351 | 5.292 | 1.50 | 7.200 | 5.892 | 0.770 | 0.680 | 646.040 | 1256.560 | 1251.440 |
| L719 | 9.345 | 5.288 | 1.50 | 7.200 | 5.848 | 0.770 | 0.680 | 693.690 | 1251.440 | 1245.950 |
| L720 | 9.346 | 5.289 | 1.50 | 7.200 | 5.801 | 0.770 | 0.680 | 654.350 | 1245.950 | 1240.770 |
| L721 | 9.345 | 5.288 | 1.50 | 7.200 | 6.074 | 0.770 | 0.680 | 687.290 | 1240.770 | 1235.330 |
| L722 | 9.346 | 5.289 | 1.50 | 7.200 | 5.208 | 0.770 | 0.803 | 800.880 | 1235.330 | 1228.990 |
| L734 | 14.437 | 4.595 | 2.00 | 9.320 | 4.723 | 0.646 | 0.603 | 451.790 | 1228.990 | 1227.150 |
| L735 | 14.409 | 4.587 | 2.00 | 9.320 | 4.753 | 0.647 | 0.603 | 505.300 | 1227.150 | 1225.100 |
| L736 | 14.443 | 4.597 | 2.00 | 9.320 | 4.308 | 0.645 | 0.723 | 559.400 | 1225.100 | 1222.820 |
| L745 | 13.518 | 4.303 | 2.00 | 11.270 | 4.694 | 0.834 | 0.723 | 576.960 | 1222.820 | 1220.760 |
| L746 | 13.551 | 4.313 | 2.00 | 11.270 | 4.672 | 0.832 | 0.724 | 629.880 | 1220.760 | 1218.500 |
| L747 | 13.505 | 4.299 | 2.00 | 11.270 | 4.651 | 0.835 | 0.724 | 474.220 | 1218.500 | 1216.810 |
| L748 | 13.541 | 4.310 | 2.00 | 11.270 | 4.643 | 0.832 | 0.724 | 502.380 | 1216.810 | 1215.010 |
| L749 | 13.531 | 4.307 | 2.00 | 11.270 | 5.041 | 0.833 | 0.724 | 377.360 | 1215.010 | 1213.660 |
| L750 | 24.540 | 4.999 | 2.50 | 11.270 | 3.933 | 0.459 | 0.668 | 536.410 | 1213.660 | 1211.740 |
| L788 | 24.103 | 4.910 | 2.50 | 18.110 | 5.201 | 0.751 | 0.668 | 373.570 | 1211.740 | 1210.450 |
| L789 | 24.118 | 4.913 | 2.50 | 18.110 | 5.204 | 0.751 | 0.668 | 569.800 | 1210.450 | 1208.480 |
| L790 | 24.088 | 4.907 | 2.50 | 18.110 | 5.201 | 0.752 | 0.669 | 661.070 | 1208.480 | 1206.200 |
| L791 | 24.075 | 4.905 | 2.50 | 18.110 | 5.200 | 0.752 | 0.669 | 629.880 | 1206.200 | 1204.030 |
| L792 | 24.127 | 4.915 | 2.50 | 18.110 | 5.201 | 0.751 | 0.669 | 471.110 | 1204.030 | 1202.400 |
| L793 | 24.077 | 4.905 | 2.50 | 18.110 | 4.787 | 0.752 | 0.789 | 493.360 | 1202.400 | 1200.700 |
| L807 | 23.790 | 4.846 | 2.50 | 21.870 | 5.693 | 0.919 | 0.789 | 603.470 | 1200.700 | 1198.670 |
| L808 | 38.687 | 5.473 | 3.00 | 21.870 | 5.446 | 0.565 | 0.554 | 505.300 | 1198.670 | 1196.970 |
| L809 | 38.736 | 5.480 | 3.00 | 21.870 | 5.704 | 0.565 | 0.554 | 533.660 | 1196.970 | 1195.170 |

APPENDIX I

XP SWMM RESULT FOR MODEL RUN NO. 5 (WEST/EAST PARALLEL)

| | | | | | | | | | | |
|-------|--------|-------|------|--------|-------|-------|-------|---------|----------|----------|
| L810 | 58.212 | 6.050 | 3.50 | 21.870 | 5.451 | 0.376 | 0.436 | 567.550 | 1195.170 | 1193.270 |
| L811 | 58.440 | 6.074 | 3.50 | 21.870 | 4.492 | 0.374 | 0.592 | 474.220 | 1193.270 | 1191.670 |
| L883 | 57.604 | 5.987 | 3.50 | 36.240 | 6.103 | 0.629 | 0.593 | 305.050 | 1191.670 | 1190.670 |
| L884 | 57.477 | 5.974 | 3.50 | 36.240 | 6.101 | 0.631 | 0.593 | 505.560 | 1190.670 | 1189.020 |
| L885 | 57.546 | 5.981 | 3.50 | 36.240 | 6.098 | 0.630 | 0.594 | 605.230 | 1189.020 | 1187.040 |
| L886 | 57.391 | 5.965 | 3.50 | 36.240 | 6.102 | 0.631 | 0.594 | 448.690 | 1187.040 | 1185.580 |
| L887 | 57.568 | 5.983 | 3.50 | 36.240 | 5.780 | 0.630 | 0.657 | 702.510 | 1185.580 | 1183.280 |
| L895 | 51.172 | 5.319 | 3.50 | 37.530 | 5.607 | 0.733 | 0.657 | 537.320 | 1183.280 | 1181.890 |
| L896 | 51.201 | 5.322 | 3.50 | 37.530 | 5.607 | 0.733 | 0.657 | 687.290 | 1181.890 | 1180.110 |
| L897 | 51.165 | 5.318 | 3.50 | 37.530 | 5.606 | 0.734 | 0.657 | 576.130 | 1180.110 | 1178.620 |
| L898 | 51.183 | 5.320 | 3.50 | 37.530 | 5.609 | 0.733 | 0.657 | 645.280 | 1178.620 | 1176.950 |
| L899 | 51.259 | 5.328 | 3.50 | 37.530 | 5.609 | 0.732 | 0.657 | 535.500 | 1176.950 | 1175.560 |
| L900 | 51.182 | 5.320 | 3.50 | 37.530 | 5.591 | 0.733 | 0.661 | 602.790 | 1175.560 | 1174.000 |
| L901 | 51.193 | 5.321 | 3.50 | 37.530 | 5.058 | 0.733 | 0.804 | 594.810 | 1174.000 | 1172.460 |
| L915 | 43.270 | 4.497 | 3.50 | 40.620 | 4.926 | 0.939 | 0.804 | 583.900 | 1172.460 | 1171.380 |
| L916 | 43.361 | 4.507 | 3.50 | 40.620 | 4.923 | 0.937 | 0.805 | 629.880 | 1171.380 | 1170.210 |
| L917 | 43.214 | 4.492 | 3.50 | 40.620 | 4.916 | 0.940 | 0.805 | 596.240 | 1170.210 | 1169.110 |
| L918 | 43.366 | 4.507 | 3.50 | 40.620 | 4.912 | 0.937 | 0.802 | 635.130 | 1169.110 | 1167.930 |
| L1048 | 93.315 | 5.867 | 4.50 | 63.480 | 6.087 | 0.680 | 0.624 | 635.060 | 1167.930 | 1166.500 |
| L1049 | 93.326 | 5.868 | 4.50 | 63.480 | 6.086 | 0.680 | 0.624 | 852.480 | 1166.500 | 1164.580 |
| L1050 | 93.223 | 5.861 | 4.50 | 63.480 | 6.083 | 0.681 | 0.624 | 956.700 | 1164.580 | 1162.430 |
| L1051 | 93.217 | 5.861 | 4.50 | 63.480 | 6.085 | 0.681 | 0.624 | 983.520 | 1162.430 | 1160.220 |
| L1052 | 93.380 | 5.871 | 4.50 | 63.480 | 6.091 | 0.680 | 0.623 | 598.700 | 1160.220 | 1158.870 |
| L1053 | 93.440 | 5.875 | 4.50 | 63.480 | 6.081 | 0.679 | 0.625 | 478.350 | 1158.870 | 1157.790 |
| L1054 | 92.942 | 5.844 | 4.50 | 63.480 | 6.083 | 0.683 | 0.625 | 470.060 | 1157.790 | 1156.740 |
| L1055 | 93.603 | 5.885 | 4.50 | 63.480 | 6.086 | 0.678 | 0.625 | 564.950 | 1156.740 | 1155.460 |
| L1056 | 92.970 | 5.846 | 4.50 | 63.480 | 6.078 | 0.683 | 0.625 | 608.470 | 1155.460 | 1154.100 |
| L1057 | 93.368 | 5.871 | 4.50 | 63.480 | 6.064 | 0.680 | 0.628 | 652.090 | 1154.100 | 1152.630 |
| L1101 | 93.331 | 5.868 | 4.50 | 63.480 | 5.540 | 0.680 | 0.740 | 661.480 | 1152.630 | 1151.140 |
| L1088 | 83.611 | 5.257 | 4.50 | 71.670 | 5.689 | 0.857 | 0.740 | 553.170 | 1151.140 | 1150.140 |
| L1089 | 83.684 | 5.262 | 4.50 | 71.670 | 5.691 | 0.856 | 0.739 | 855.920 | 1150.140 | 1148.590 |
| L1090 | 83.711 | 5.263 | 4.50 | 71.670 | 5.690 | 0.856 | 0.739 | 618.070 | 1148.590 | 1147.470 |
| L1091 | 83.686 | 5.262 | 4.50 | 71.670 | 5.695 | 0.856 | 0.739 | 646.040 | 1147.470 | 1146.300 |
| L1092 | 84.008 | 5.282 | 4.50 | 71.670 | 5.694 | 0.853 | 0.740 | 367.130 | 1146.300 | 1145.630 |
| L1115 | 83.664 | 5.260 | 4.50 | 71.670 | 5.680 | 0.857 | 0.741 | 414.350 | 1145.630 | 1144.880 |
| L1116 | 83.450 | 5.247 | 4.50 | 71.670 | 5.684 | 0.859 | 0.741 | 460.900 | 1144.880 | 1144.050 |
| L1117 | 83.845 | 5.272 | 4.50 | 71.670 | 5.692 | 0.855 | 0.739 | 385.060 | 1144.050 | 1143.350 |
| L1118 | 83.708 | 5.263 | 4.50 | 71.670 | 5.689 | 0.856 | 0.740 | 568.450 | 1143.350 | 1142.320 |
| L1093 | 83.685 | 5.262 | 4.50 | 71.670 | 5.685 | 0.856 | 0.740 | 712.330 | 1142.320 | 1141.030 |
| L1094 | 83.532 | 5.252 | 4.50 | 71.670 | 5.689 | 0.858 | 0.740 | 759.270 | 1141.030 | 1139.660 |
| L1095 | 83.887 | 5.275 | 4.50 | 71.670 | 5.689 | 0.854 | 0.741 | 653.940 | 1139.660 | 1138.470 |
| L1110 | 83.489 | 5.249 | 4.50 | 71.670 | 5.690 | 0.858 | 0.741 | 660.200 | 1138.470 | 1137.280 |
| L1111 | 83.994 | 5.281 | 4.50 | 71.670 | 5.696 | 0.853 | 0.740 | 581.020 | 1137.280 | 1136.220 |

APPENDIX I

XP SWMM RESULT FOR MODEL RUN NO. 5 (WEST/EAST PARALLEL)

| | | | | | | | | | | |
|-------|---------|-------|------|--------|-------|-------|-------|----------|----------|----------|
| L1112 | 83.606 | 5.257 | 4.50 | 71.670 | 5.692 | 0.857 | 0.740 | 802.190 | 1136.220 | 1134.770 |
| L1113 | 83.878 | 5.274 | 4.50 | 71.670 | 5.708 | 0.854 | 0.738 | 593.630 | 1134.770 | 1133.690 |
| L1119 | 83.472 | 5.248 | 4.50 | 71.670 | 5.938 | 0.859 | 0.735 | 499.510 | 1133.690 | 1132.790 |
| L618 | 116.130 | 5.914 | 5.00 | 76.660 | 6.095 | 0.660 | 0.612 | 533.140 | 1132.790 | 1131.730 |
| L619 | 116.005 | 5.908 | 5.00 | 76.660 | 6.096 | 0.661 | 0.612 | 866.960 | 1131.730 | 1130.010 |
| L620 | 116.256 | 5.921 | 5.00 | 76.660 | 6.083 | 0.659 | 0.614 | 802.990 | 1130.010 | 1128.410 |
| L621 | 115.903 | 5.903 | 5.00 | 76.660 | 5.667 | 0.661 | 0.697 | 873.540 | 1128.410 | 1126.680 |
| L630 | 113.514 | 4.778 | 5.50 | 79.020 | 4.991 | 0.696 | 0.633 | 1146.460 | 1126.680 | 1125.370 |
| L631 | 114.092 | 4.802 | 5.50 | 79.020 | 4.989 | 0.693 | 0.634 | 1048.240 | 1125.370 | 1124.160 |
| L632 | 113.264 | 4.767 | 5.50 | 79.020 | 4.987 | 0.698 | 0.634 | 861.440 | 1124.160 | 1123.180 |
| L633 | 114.225 | 4.808 | 5.50 | 79.020 | 4.989 | 0.692 | 0.635 | 812.440 | 1123.180 | 1122.240 |
| L634 | 113.776 | 4.789 | 5.50 | 79.020 | 4.908 | 0.695 | 0.651 | 705.620 | 1122.240 | 1121.430 |
| L635 | 113.367 | 4.772 | 5.50 | 79.020 | 4.541 | 0.697 | 0.735 | 649.300 | 1121.430 | 1120.690 |
| L636 | 95.506 | 4.020 | 5.50 | 81.210 | 4.348 | 0.850 | 0.735 | 815.950 | 1120.690 | 1120.030 |
| L646 | 95.683 | 4.027 | 5.50 | 81.210 | 4.344 | 0.849 | 0.736 | 985.390 | 1120.030 | 1119.230 |
| L647 | 95.121 | 4.004 | 5.50 | 81.210 | 4.347 | 0.854 | 0.736 | 772.720 | 1119.230 | 1118.610 |
| L648 | 96.069 | 4.044 | 5.50 | 81.210 | 4.350 | 0.845 | 0.737 | 940.830 | 1118.610 | 1117.840 |
| L649 | 95.271 | 4.010 | 5.50 | 81.210 | 4.332 | 0.852 | 0.737 | 981.510 | 1117.840 | 1117.050 |
| L650 | 95.542 | 4.021 | 5.50 | 81.210 | 4.303 | 0.850 | 0.747 | 741.220 | 1117.050 | 1116.450 |
| L1200 | 95.635 | 4.025 | 5.50 | 81.210 | 4.200 | 0.849 | 0.775 | 530.180 | 1116.450 | 1116.020 |
| L1201 | 101.866 | 4.288 | 5.50 | 91.960 | 4.658 | 0.903 | 0.777 | 858.530 | 1116.020 | 1115.230 |
| L1202 | 101.381 | 4.267 | 5.50 | 91.960 | 4.657 | 0.907 | 0.777 | 691.220 | 1115.230 | 1114.600 |
| L1203 | 102.027 | 4.294 | 5.50 | 91.960 | 4.655 | 0.901 | 0.778 | 639.160 | 1114.600 | 1114.010 |
| L1204 | 101.201 | 4.260 | 5.50 | 91.960 | 4.652 | 0.909 | 0.778 | 704.680 | 1114.010 | 1113.370 |
| L1205 | 101.780 | 4.284 | 5.50 | 91.960 | 4.668 | 0.904 | 0.774 | 533.400 | 1113.370 | 1112.880 |
| L1206 | 102.010 | 4.294 | 5.50 | 91.960 | 4.670 | 0.901 | 0.774 | 834.430 | 1112.880 | 1112.110 |
| L1207 | 101.922 | 4.290 | 5.50 | 91.960 | 4.664 | 0.902 | 0.774 | 857.590 | 1112.110 | 1111.320 |
| L1208 | 101.654 | 4.279 | 5.50 | 91.960 | 4.670 | 0.905 | 0.774 | 556.550 | 1111.320 | 1110.810 |
| L1209 | 101.155 | 4.258 | 5.50 | 91.960 | 4.733 | 0.909 | 0.771 | 440.830 | 1110.810 | 1110.410 |
| L1210 | 101.838 | 4.286 | 5.50 | 91.960 | 5.884 | 0.903 | 0.752 | 880.750 | 1110.410 | 1109.600 |

APPENDIX J

Model Run No. 5 Estimated Cost Data

APPENDIX J
DETAILED COST ESTIMATE FOR MODEL RUN NO. 5 (WEST/EAST PARALLEL)



DETAILED COST ESTIMATE

CLASS:

PROJECT : STEVENS CREEK BASIN TRUNK SEWER
 JOB # : 6903A.10
 LOCATION : LINCOLN, NEBRASKA
 ELEMENT : 2 - EASTSIDE - E-11/E-6: NE WWTP

LOCATION FACTOR: 0.85

DATE : 6/1/2004

BY : MJS

REVIEWED BY:

| SPEC. NO. | DESCRIPTION | QUAN | UNIT | MATERIAL | INSTALL | UNIT COST | SUBTOTAL | TOTAL |
|--------------|--|-----------|-------|----------|----------|-----------|----------------|--------------------|
| 02000 | SITEWORK | | | | | | | |
| | MANHOLES | | | | | | | |
| | > 36" diameter | 9 | LS | | | \$12,000 | \$108,000.00 | |
| | </= 36" diameter | 0 | LS | | | \$3,500 | \$0.00 | |
| | TUNNELING | | | | | | | |
| | FOR 66-INCH | 1,050 | LF | | | \$990 | \$1,039,500.00 | |
| | | | | | | | | |
| | | | | | | | | |
| | SUBTOTAL SITEWORK | | | | | | | \$1,147,500 |
| 03000 | CONCRETE | | | | | | | |
| | Junction Box | 2 | LS | | | \$75,000 | \$150,000.00 | |
| | | | | | | | | |
| | SUBTOTAL CONCRETE | | | | | | | \$150,000 |
| 15000 | MECHANICAL | | | | | | | |
| | HOBAS PIPE | | | | | | | |
| | 66-INCH | 7,500 | LF | \$205.00 | \$379.25 | \$584 | \$4,381,875.00 | |
| | Permanent Easement | 300,000 | sq ft | \$0.50 | | \$0.50 | \$150,000.00 | |
| | Construction Easement | 1,200,000 | sq ft | \$0.05 | | \$0.05 | \$60,000.00 | |
| | SUBTOTAL MECHANICAL | | | | | | | \$4,591,875 |
| | | | | | | | | |
| | TOTAL DIRECT COST | | | | | | | \$5,889,375 |
| | CONTINGENCY | | | | | 25.00% | \$1,472,344 | |
| | SUBTOTAL | | | | | | | \$7,361,719 |
| | GENERAL CONDITIONS | | | | | 10.00% | \$736,172 | |
| | SUBTOTAL | | | | | | | \$8,097,891 |
| | TOTAL ESTIMATED CONSTRUCTION COST | | | | | | | \$8,097,891 |
| | ENGINEERING & LEGAL FEES | | | | | 20.00% | \$1,619,578 | |
| | TOTAL ESTIMATED PROJECT COST | | | | | | | \$9,717,469 |

APPENDIX K

Subbasin E-2 Model Output

APPENDIX K
XP SWMM RESULTS FOR MODEL RUN SUBBASIN E-2

| Link Name | Design Full Ft | Design Velocity (ft/s) | Diameter (ft) | Max Flow (ft^3/s) | Max Velocity (ft/s) | Max Flow/Design Flow | d/D | Length (ft) | US_Invert (ft) | DS_Invert (ft) |
|-----------|----------------|------------------------|---------------|-------------------|---------------------|----------------------|-------|-------------|----------------|----------------|
| P12 | 8.137 | 4.604 | 1.500 | 5.272 | 5.877 | 0.648 | 0.679 | 1100.000 | 1193.210 | 1186.610 |
| P11 | 8.137 | 4.604 | 1.500 | 6.260 | 5.876 | 0.769 | 0.680 | 1100.000 | 1186.610 | 1180.010 |
| P10 | 8.137 | 4.604 | 1.500 | 6.260 | 4.970 | 0.769 | 0.680 | 950.000 | 1180.010 | 1174.310 |
| P9 | 17.523 | 5.578 | 2.000 | 8.280 | 5.016 | 0.473 | 0.551 | 950.000 | 1174.310 | 1168.610 |
| P8 | 17.523 | 5.578 | 2.000 | 9.850 | 5.544 | 0.562 | 0.552 | 80.000 | 1168.610 | 1168.130 |
| P7 | 17.523 | 5.578 | 2.000 | 9.850 | 5.560 | 0.562 | 0.552 | 750.000 | 1168.130 | 1163.630 |
| P6 | 17.531 | 5.580 | 2.000 | 9.850 | 5.106 | 0.562 | 0.642 | 378.000 | 1163.630 | 1161.360 |
| P5 | 17.523 | 5.578 | 2.000 | 12.430 | 5.838 | 0.709 | 0.642 | 325.000 | 1161.360 | 1159.410 |
| P4 | 17.523 | 5.578 | 2.000 | 12.430 | 5.846 | 0.709 | 0.642 | 745.000 | 1159.410 | 1154.940 |
| P3 | 17.527 | 5.579 | 2.000 | 12.430 | 5.841 | 0.709 | 0.642 | 728.000 | 1154.940 | 1150.570 |
| P2 | 17.523 | 5.578 | 2.000 | 12.430 | 5.836 | 0.709 | 0.642 | 615.000 | 1150.570 | 1146.880 |
| P1 | 17.512 | 5.574 | 2.000 | 12.430 | 5.873 | 0.710 | 0.642 | 550.730 | 1146.880 | 1143.580 |

APPENDIX L

Subbasins E-2 Model Estimated Cost Data

APPENDIX L
DETAILED COST ESTIMATE FOR MODEL RUN SUBBASIN E-2

|  CAROLLO e n g i n e e r s | | PROJECT SUMMARY | |
|---|---|--------------------|-----------------|
| PROJECT : | <u>STEVE'S CREEK GRAVITY SEWER</u> | ESTIMATE CLASS: | <u>3</u> |
| JOB # : | <u>6903A.10</u> | DATE : | <u>6/1/2004</u> |
| LOCATION : | <u>LINCOLN, NEBRASKA</u> | BY : | <u>MJS</u> |
| ELEMENT # | ELEMENT | COST | |
| | | | |
| | | | |
| 1 | MAIN TRUNK OF SUBBASIN E-2 (8,300 LF of 18 THRU 24-INCH PIPE) | \$1,760,992 | |
| | TOTAL DIRECT COST | \$1,760,992 | |
| | CONTINGENCY | 25.00% | \$440,248 |
| | SUBTOTAL | | \$2,201,240 |
| | GENERAL CONDITIONS | 10.00% | \$220,124 |
| | SUBTOTAL | | \$2,421,364 |
| | TOTAL ESTIMATED CONSTRUCTION COST | \$2,421,364 | |
| | ENGINEERING AND LEGAL FEES | 20.00% | \$484,273 |
| | TOTAL ESTIMATED PROJECT COST | \$2,905,636 | |
| | | | |